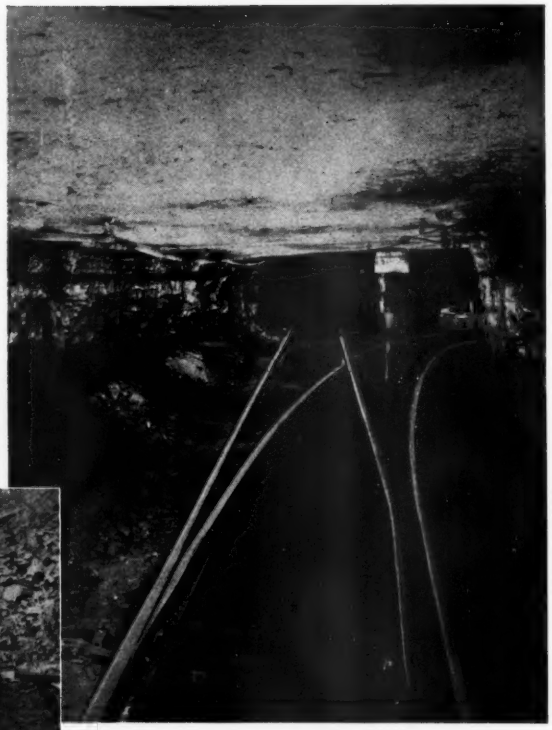
MINING CONGRESS JOURNAL

OFFICIAL

UBLICATION

Do Away WITH RAIL JOINTS



Above: Thermit Welded track at Princeton Mining Co., Princeton, Ind.

Left: Welding rails into long lengths at Gauley Mountain Co.

. . . and forget rail joint MAINTENANCE

Because Thermit Welded Continuous Rail increases rail life and reduces track maintenance costs, it soon pays for itself. There are no gaps for wheels to pound, no rail ends to batter; there are no plates to crack or loosen, no rail bonds to corrode; there is nothing to require attention at any time.

Thermit Welds reduce power costs, too. By eliminating power loss at joints they give 20% greater conductivity than jointed rails. Because of the excellent electrical characteristics of the Thermit Weld, combined with the smooth-riding qualities of continuous rails, considerably less power is required at all times to haul trains over welded track. There is no swaying or jolting of cars; derailment and spillage of coal are reduced to a minimum. More efficient operation of haulage lines is assured because of the higher operating speeds that become possible. Maintenance cost of equipment is reduced because wear and tear on the cars and locomotives is less. Write for details.

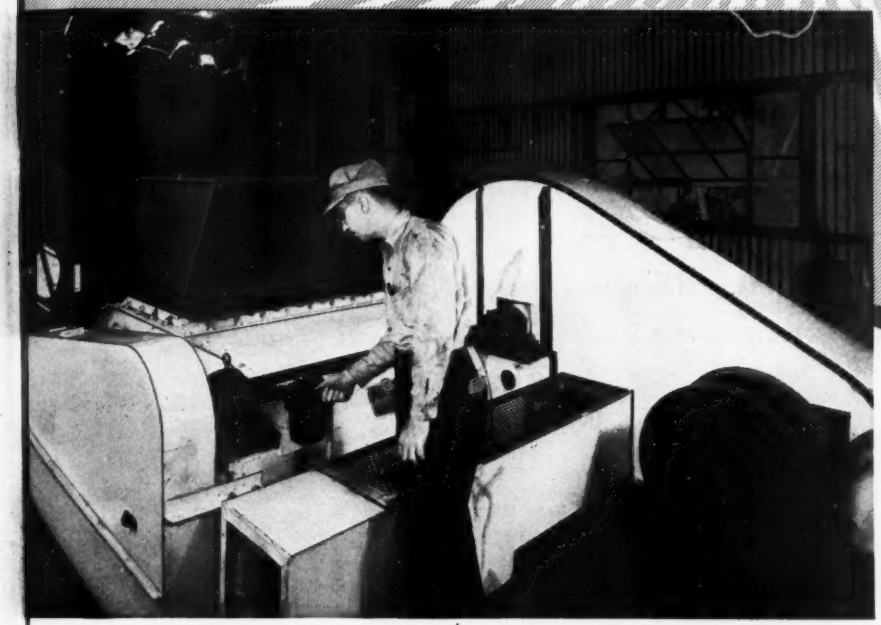
THERMIT Rail WELDING

METAL & THERMIT CORPORATION • 120 BROADWAY, NEW YORK

ALBANY • CHICAGO • CINCINNATI • DETROIT • MINNEAPOLIS • PITTSBURGH
SO. SAN FRANCISCO • TORONTO

For better results in electric arc welding, investigate MUREX line of HEAVY COATED ELECTRODES including especially designed rods for building up and hard surfacing.

BIGGER PROFITS FROM STOKER-SIZES



With the POPULAR

LINK-BELT 2-ROLL COAL SIZER

— More Premium Sizes
— Less Degradation
— Less Oversize
— Lower Preparation Cost

Producing Outstanding Results In Many Coal Fields

You can reduce costs when producing stoker-sizes from larger-sizes and at the same time decrease oversize and undersize by the installation of the popular Link-Belt Sizer. Its many exclusive and practical features, developed from years of research and experience, have proved advantageous to operators in many coal fields.

A recent performance test, as shown in the table below, with two different roll settings, varying only by 3/16", illustrates conclusively the extreme accuracy of size-control obtainable with this machine. Here the job was to produce a minus 1" square mesh product from a 2" x 1" feed.

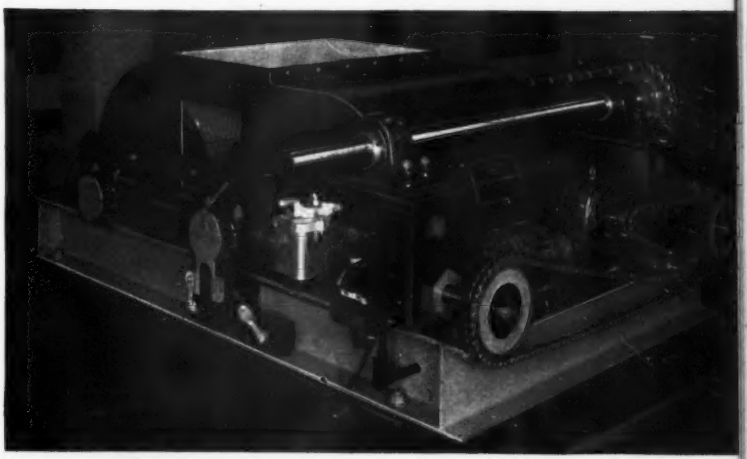
	With 29 3/4" Roll Settings	With 29 15/16" Roll Settings
Plus 1" sq. mesh (Oversize)	0.02%	14.65%
1" x 3/4" thru sq. mesh	21.93%	45.40%
3/4" x 1/2" thru sq. mesh	36.24%	20.84%
1/2" x 1/4" thru sq. mesh	22.22%	10.30%
1/4" x 1/8" thru sq. mesh	8.70%	4.20%
1/8" x 0" thru sq. mesh	10.89%	4.61%

Look at this result: Where the desired products were 1" x 3/16" and 3/16" x 0" from a feed of 3" x 1" coal, another performance test showed—77.3% of 1" x 3/16"—17.0% of 3/16" x 0"—the balance, only 5.7% oversize. These are but a few examples of results being obtained from Link-Belt Sizers in many coal fields throughout the country.

"Breaks" Without "Crushing"

Scientifically-spaced, accurately-meshed pyramidal teeth, combined with a low roll speed, cause a piercing action which reduces the coal without shattering or crushing.

You owe it to yourself to investigate the extra profit possibilities of this unit in reducing both anthracite and bituminous coals. Let us send you further information. Address Dept. MCJ at nearest office listed below.



New Mechanical Roll Adjuster

You press a button, then almost instantly the necessary adjustments in roll settings are made, to produce sizes varying from 3/4" to 8". A very small reversing motor operates the adjusting mechanism. Where frequent adjustments of roll settings are required, considerable savings in time and production costs are assured. Compare this with the time and effort required to make manual adjustments on ordinary types of crushers.

8261-A

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MINING CONGRESS JOURNAL

Vol. 26 DECEMBER, 1940 No. 12

Holiday Greetings

With the approach of the Yuletide, Mining Congress Journal extends to its readers best wishes for a Merry Christmas and a Happy and Prosperous New Year. In the fulfillment of its added duties under the National Defense Program the mining industry has experienced better working time, increased production and expansion of activity during the past year and the prospects for 1941 appear bright.

We appreciate the loyal support of our readers and contributors, and pledge the columns of this publication to service in the best interests of the mining industry and its people in the years to come.

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Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress

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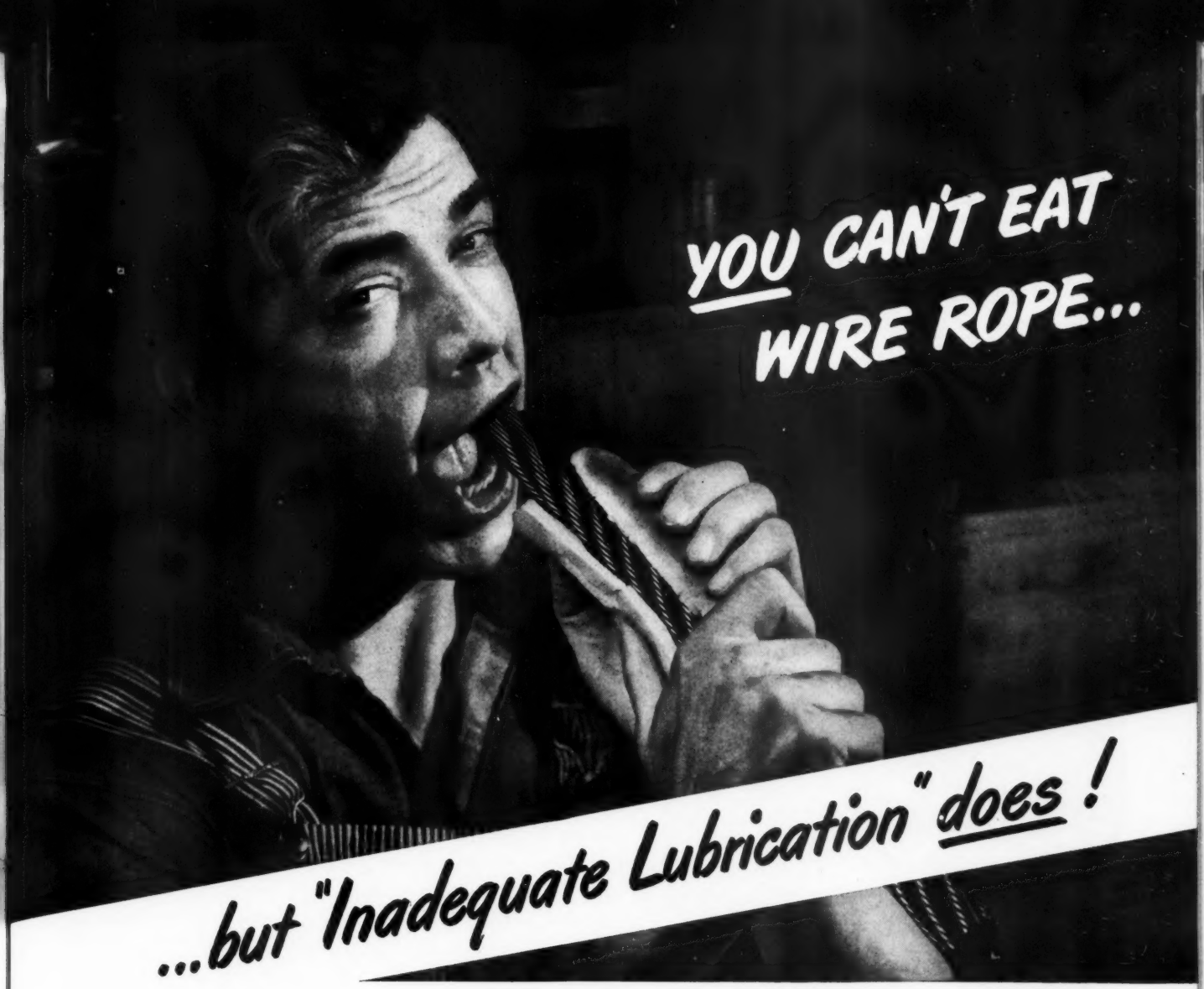

Perhaps you never thought of lubrication in just this way — but picture to yourself thousands of tiny "bearings" sliding and pressing against each other. Naturally, they must be lubricated — and naturally you'll see that they are lubricated in your wire ropes — when you realize what it means in dollars and cents.

A proper wire rope lubricant regularly applied to the rope on the job, forms a protective coating that keeps those thousands of "bearings" operating with minimum friction. The result: — Wire fatigue and corrosion checked; more uniform wear; longer rope life.

Be sure your lubricant is the *right* one, that you are applying it properly and with sufficient frequency.

JOHN A. ROEBLING'S SONS CO.
Trenton, N. J. *Branches in Principal Cities*

CORRECT LUBRICATION:

1. *Reduces Rope Wear*
2. *Prevents Corrosion*
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5. *Provides Greater Safety*

This advertisement is published in the interest of all wire rope users to help them obtain greater safety, service and efficiency from their wire rope.

ROEBLING

JAR *Wire Rope*

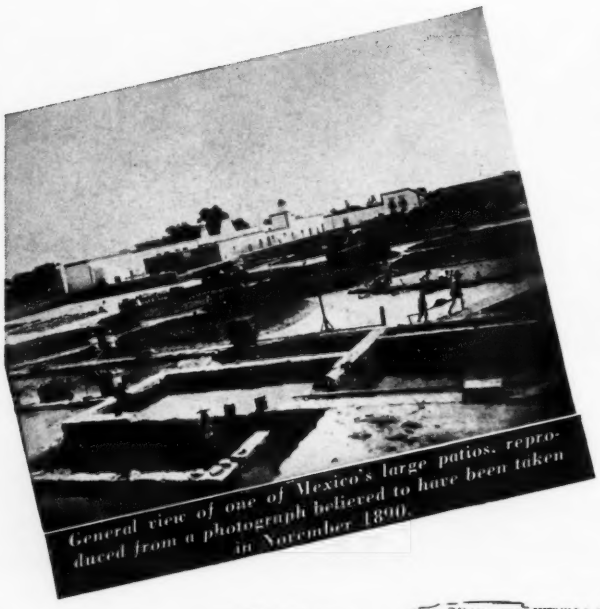
Ask about ROEBLING "BLUE CENTER" WIRE ROPE . . . *either preformed or standard*

Just fifty years ago · late in November 1890 · the patio mule drivers

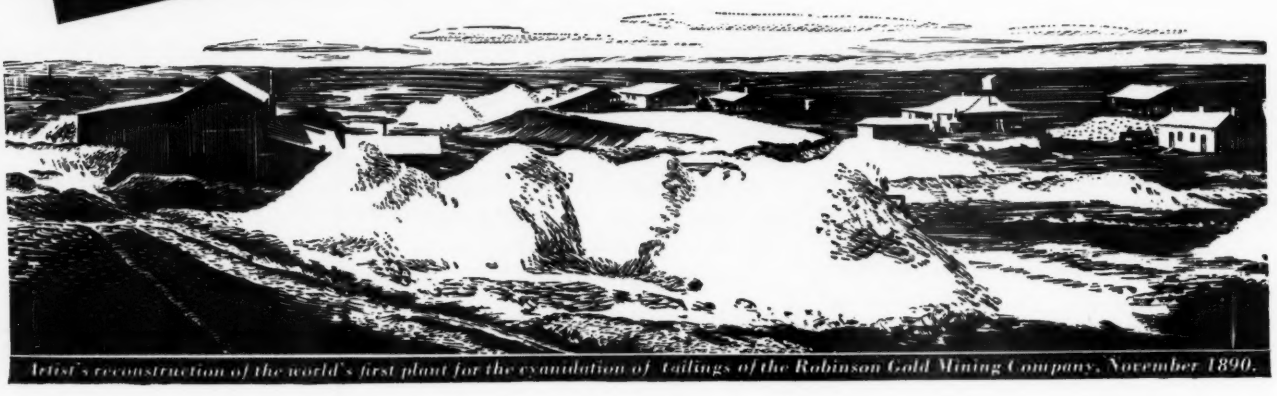
plodded stolidly onward, all unknowing that half around the globe on the Rand the world's first commercial cyanidation plant was about to start its first run. After 333 years of amazingly high recoveries, considering its inherent simplicity, the patio was soon to be replaced by a new chemical process . . . cyanidation.

Viewed with considerable skepticism as a substitute for older beneficiation methods, cyanidation got its humble speculative start when the Gold Recovery Syndicate contracted to treat 10,000 tons of tailings for the Robinson Gold Mining Company. This rudimentary plant made "what had been regarded as a pretty chemical scheme into a sound commercial success."*

In its first six months, the Robinson Cyanidation plant increased recoveries to 75% overall, as compared to 63% by amalgamation alone. Within the decade recoveries approaching 90% on Rand ore were not uncommon and "practically the whole of the mines converted themselves into dividend payers . . . for it is a most remarkable fact that scarcely six of the Rand mines would today pay



General view of one of Mexico's large patios, reproduced from a photograph believed to have been taken in November 1890.



Artist's reconstruction of the world's first plant for the cyanidation of tailings of the Robinson Gold Mining Company, November 1890.

AMERICAN CYANAMID

A Complete Metallurgical-

30 ROCKEFELLER PLAZA,

any dividends at all but for the profits received from the cyanidation of their tailings."*

In the first fifty years of cyanidation, reduction plants have been developed amazingly in comparison with the first crude "square vats", percolators and zinc boxes of the original Robinson plant. During this period comparable progress has also been made in the chemistry of the cyanidation process. Notwithstanding this progress, however, research goes steadily forward in the Cyanamid Ore Dressing Laboratory on the chemistry of various phases of the cyanidation process, on the cyanidation of refractory ores, on the cyanidation of flotation concentrates and in the development of new metallurgical chemicals.

In the year ahead Cyanamid confidently hopes and expects to provide the mining industry with even better technical service through Cyanamid Ore Dressing Laboratory and Cyanamid Field Engineers, as well as ample sources of supply for essential metallurgical chemicals through Cyanamid's production facilities.

**Alfred James: "Cyanide Practice", London, December, 1901.*

General view of a typical modern Cyanidation Plant on the Rand today.

COMPANY
Chemical Service
NEW YORK

American Cyanamid Company
30 Rockefeller Plaza, New York, N. Y.

Please send me copies of Ore Dressing Notes which you have published on cyanidation and the cyanidation of flotation concentrates.

Name.....

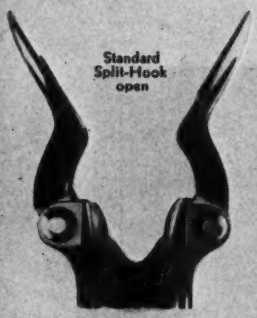
Address.....

MASCOT

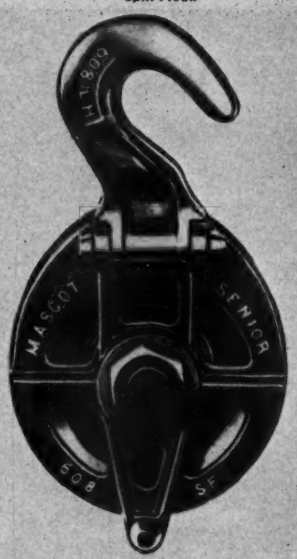
Split-Hook Sheave and "Saflex" Wedgeye

Mascot Junior Showing Reverse Split Safety Hook

Reverse Split Safety Hook open



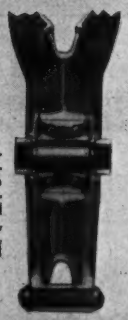
Standard Split-Hook open



Mascot Senior Showing Standard Split-Hook

Mascot Jumbo Showing Standard Split-Hook

Standard Split-Hook closed



A Mascot Split-Hook Sheave partly in section to show the construction when furnished with a sealed, greased-for-life, anti-friction ball bearing.

Mascot "Saflex" Wedgeye

The New Mascot riveted assembly Sheave is now available in three designs, known as the Junior, Senior and Jumbo, each of which can be furnished with the reverse split "safety" hook, or standard Mascot split-hook. They have wider wheels, lower hook suspension, improved balance and their use results in less rope wear. Side frames, wheels and hooks are of R-M manganese steel.

In slushing operations, the Mascot Split-Hook Sheave does away with interruptions caused by head block trouble. Its quick opening feature, wide wheel capacity for passing square knots and a design which prevents parts from being lost in the stopes, make for continuous operation throughout every hour of the shift.

These sheaves have been accepted by many of the larger mining companies in this and other countries and have proved absolutely dependable.

Mascot JUNIOR Sheave — The lightest of the three designs, constructed to meet the average slushing requirements—equipped with a large size Chrysler "Oilite" self-oiling bronze bearing.

Mascot SENIOR Sheave — Slightly heavier in construction than the Junior Sheave, strengthened to withstand more abuse. Equipped with New Departure, greased-for-life, anti-friction bearings. Very desirable for dry dusty mines with abrasive material.

Mascot JUMBO Sheave — For severe service where larger ropes are used and where smaller diameter wheels are desirable—particularly suitable for wet work or where very abrasive materials are present. Equipped with New Departure, greased-for-life, anti-friction bearings, protected on either side by thick oil-treated felt washers.

Mascot "SAFLEX" Wedgeye — Takes the place of a rigid eye bolt—to furnish a safe, secure sheave anchorage. All bending and shock is taken up in the rope, lessening the likelihood of the wedge becoming loose and permitting the eye bolt to pull out. "Saflex" Wedgeyes are available in any desired rope length to meet individual requirements.

SIZES AVAILABLE and PRICES*

Size	Mascot Junior	Mascot Senior	Mascot Jumbo
8" ...	$24.50	$29.50	$34.50
10" ...	34.50	39.50	44.50
12" ...	——	49.50	54.50

Type of Hook Optional

Mascot "Saflex" Wedgeye Standard—with 18" Trulay Rope.....$10.95 Additional lengths at $.80 per foot of rope over 18".

*All Prices F.O.B. Bristol, Virginia. Subject to change without notice.

HARLEY A. COY

c/o American Zinc Co. of Tenn. - Mascot, Tenn. U.S.A.

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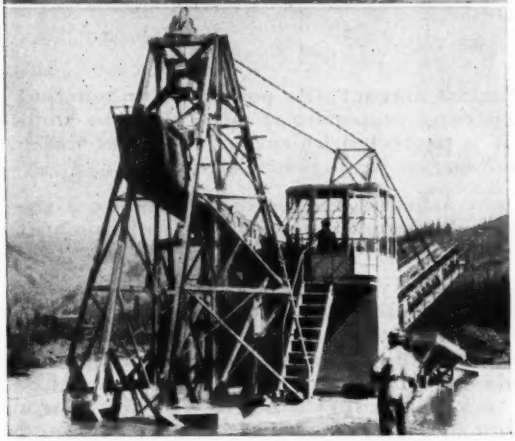
YUBA Presents the Becker-Hopkins "Single Bucket" Dredge



These Becker-Hopkins "single bucket" dredges dig 15-17 ft. below water level on gold properties in Alaska. One of them has operated for two seasons.

The digging unit of a Becker-Hopkins dredge is positive in action—cleans bedrock—handles boulders.

Impressed by two seasons of successful operation in Alaska, Yuba has acquired exclusive manufacturing and sales rights for the Becker-Hopkins "single bucket" dredge. Now Yuba offers this new placer dredge as the ideal equipment for small, shallow deposits, particularly if large boulders are present. Patented new features of the Becker-Hopkins dredge make "single-bucket" dredging economical and practicable.

Here in a single, self-contained floating unit are complete digging, classifying and recovery elements which field experience has proved operate at costs comparable with bucket line dredges. As the need for separate drag line or similar excavating equipment is eliminated, operating efficiency is greatly improved and costs can be reduced.

Operating principles of the Yuba Becker-Hopkins "single-bucket" dredge are simple and practical. Operating from a fixed floating position each cut is made horizontally on the pond bottom and follows the preceding cut—the bottom is dug systematically and thoroughly. At the end of each bottom cut the bucket moves upward in an arc, cutting the bank face. The dredge bucket is integral with the telescoping U-shaped trough which forms the boom and conveys material from bucket to screen. From the screen aft, this new, moderately priced, "single bucket" dredge is similar in all essentials to any successful dredge. Rock tailings are disposed of by a suitable stacker.

If you have one or more small, shallow deposits upon which a low cost, easily transported dredge can be used, consult Yuba. The new Yuba Becker-Hopkins dredge offers operating economies not found previously except on bucket line dredges.

YUBA MANUFACTURING CO.

351 California St. San Francisco Calif.

Cable Address-Yubaman, San Francisco-Yardage, London

YUBA DREDGES — PROVED DEPENDABILITY ROUND THE WORLD

MEN MAY COME AND MEN MAY GO

BUT MOTORS STAY AND WORK

YES, MOTORS stay and work as long as the insulation on their windings can resist the heat built up by continuous operation and peak loads. The proper magnet wire is a serious problem right now because motors in many mines are working to capacity.

Peak loads build up intense motor heat. Continuous operation allows no cooling-off periods. These conditions are very hard on motors wound with ordinary magnet wire. The insulation on that wire breaks down rapidly, and the motors stop. That means trouble and expense.

Deltabeston, Deltaglass, Formex Asbestos, and Formex Glass Magnet Wire can withstand the heat built up by peak loads and continuous operation. Deltabeston magnet wire performance is assured by the extreme purity of the asbestos used and the efficiency of the patented "felting" process which applies that asbestos to the copper conductor.

Deltaglass magnet wire possesses the inherent heat-resisting properties of spun glass. In addition, it is protected by special varnishes which greatly increase its dielectric strength.

Formex Asbestos and Formex Glass are high-quality G-E Magnet Wires with outstanding heat resistance.

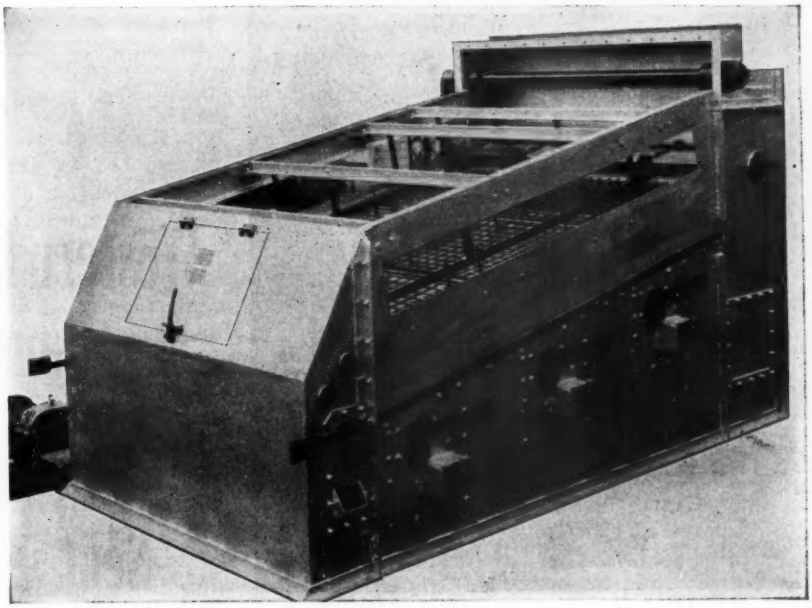
To cut down your motor repair bills, specify Deltabeston or Deltaglass magnet wire on your new motors. If your present motors must be sent out for rewinding, specify that Deltabeston or Deltaglass be used on them. Then when they come back to you they'll be ready to work for a long time in spite of the heat from peak loads and continuous operation.

If you do your own motor repair work you can purchase these General Electric magnet wires from all G-E Merchandise Distributors and from the Graybar Electric Company.

GENERAL ELECTRIC

R AND S COMPANY

Announces NEW
STUMP AIRFLOW COAL CLEANER



CLEAN your coal the R&S WAY

Whatever your preparation needs may be our engineers can find the answer.

COAL CLEANING BY AIR PROCESS
COMBINATION WET AND DRY CLEANING PLANTS
COAL DRYERS
DEDUSTING PLANTS
COAL TIPPLES
REVOLVING DUMPS
CAR FEEDERS

Bulletin No. 153 tells complete story of R&S Service and Equipment...

WRITE FOR IT TODAY

• Get all the details on this advanced design — Controlled Feed — CONTROLLED AIR to all parts of cleaning deck — Multiple Refuse Discharge — Large Tonnages — Made in widths to suit capacity.

R&S has, during the past 38 years, through contact with the industry, developed better methods of coal preparation with least cost to the operator—made possible maximum efficiency and recovery—and has produced better systems for preparing coal for today's highly competitive market. Whether you desire a better competitive position by replacement of obsolete equipment, or wish to insure the efficiency of a new plant, consult with our engineers and find out how R&S can help you.

Of all air cleaning plants built during the past five years, ninety per cent have employed the STUMP process.

We invite your inquiry and place at your disposal our consulting service, testing plant, and laboratory.

ROBERTS and SCHAEFER CO.
307 North Michigan Avenue, Chicago
P. O. Box 865 PITTSBURGH, PA.
P. O. Box 570 HUNTINGTON, W. VA.

Mission Dolores, built by the early Spanish Padres

Historic and Beautiful

San Francisco Invites You

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Build your vacation next year around the 1941 Convention and Exposition... Your San Francisco railroad ticket will take you to Vancouver, Seattle, Portland, or Los Angeles at no extra fare... See your local agent for arrangements or write us direct.

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Sidewalk Cauldrons, Colorful Fisherman's Wharf

A JOURNAL FOR THE ENTIRE MINING INDUSTRY—PUBLISHED BY THE AMERICAN MINING CONGRESS

MINING CONGRESS JOURNAL

Vol. 26 DECEMBER, 1940 No. 12

OFF DUTY ACCIDENTS

A TIMELY article by Vice President and Treasurer Andrew Fletcher of the St. Joseph Lead Company which appears in this issue, devoted to the important topic "Sick Absenteeism in the Non-Ferrous Mining Industry," urges the keeping of statistics by the mining industry as a first step to combatting a serious loss to the nation. The accomplishment of Mr. Fletcher's own company in reducing all respiratory disease cases to 6.7 per thousand employes, as compared with the United States Public Health Service 1939 survey showing 33.9 cases, is sufficient to compel sober attention. Working time lost by employes through sickness is directly comparable to time lost as the result of industrial injury, and the physical recovery of the workmen to a status of full efficiency may be much longer delayed. In accident studies the direct losses of wages and production have been computed, but the hidden, indirect costs—which include the extremely adverse effects of an accident on a man's person and on his family, the expense of replacing an injured man with the resultant increased cost of supervision, spoilage of material, and lower output, plus the cost of repairing equipment that may have been damaged in an accident—are known to be considerably greater and have been estimated by Dan Harrington of the United States Bureau of Mines at three times the direct costs.

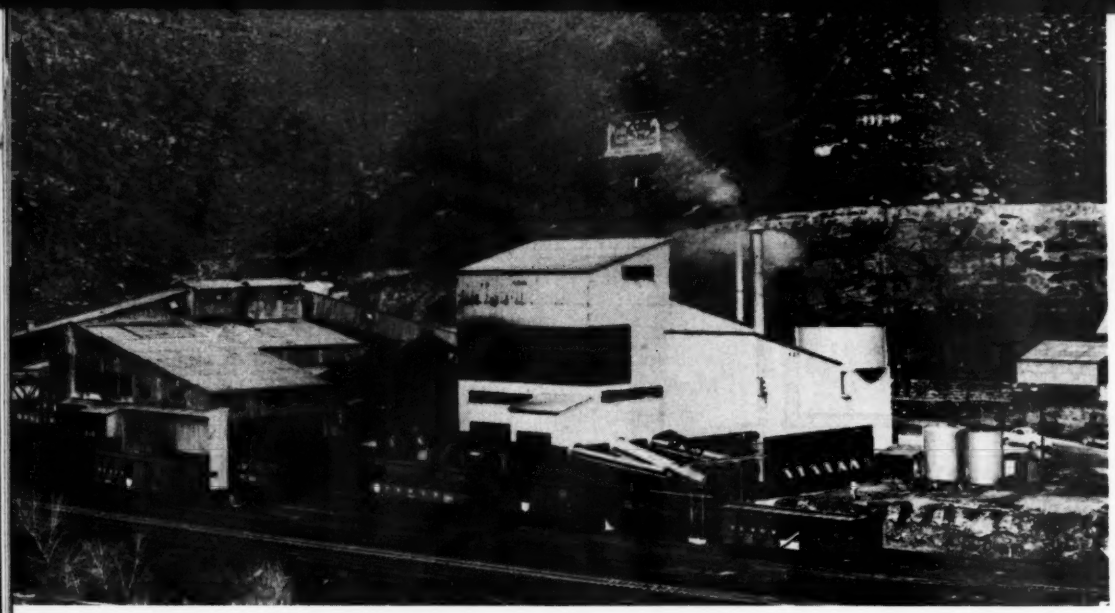
In discussing Mr. Fletcher's article, General Manager Harry M. Lavender, of the Phelps Dodge Corporation, makes the further interesting point that perhaps we are neglecting to take sufficient measures toward the elimination of accidents to employes which are incurred during their off-duty hours away from our industrial plants. Mr. Lavender makes the telling point that "after all, whether a man is injured on or off duty, the disorganization of the operating force is the same, due to his absenteeism." He further points out that since the start of operations at Morenci in 1937, the property has had but one fatal accident; whereas during this period six of the workmen have been killed in the vicinity of the town by highway accidents.

Further proof that Mr. Lavender's point is well taken is furnished by President Eugene McAuliffe, Union Pacific Coal Company, from his operations in Wyoming, where in the period 1937 to date ten fatalities occurred at the mines while ten employes were killed in off-duty accidents and six employe dependents were killed. In the years 1925 to date, 42 employes were killed in off-duty accidents and 14 of their dependents suffered fatalities. These figures emphasize the desirability of a thorough-going safety program among workers and their families, aimed at the prevention of "ordinary" accidents.

IN LINE OF DUTY

THE job of guarding the best interests of our nation in current procurement and also in stockpiling sufficient quantities of the strategic, critical and essential mineral raw materials is now a divided responsibility of the National Defense Commission, the Reconstruction Finance Corporation, the Procurement Division of the Treasury and the Ordnance Departments of the Army and Navy.

The men engaged in the work of finding, stimulating production and purchasing these vitally important materials are geologists and mining engineers, business men of wide experience and military and naval officers who are specialists in their fields. They are self-sacrificing, patriotic Americans of high character and high caliber. It is well that this much in the metals and minerals procurement situation should be widely known, because in the months to come there will be producers or potential producers or promoters in many parts of the country who will be prone to feel and who may give vent to expressions that their own efforts to accompany the defense program by the production of needed materials are being baffled, disregarded or set at naught by a lot of entrenched bureaucrats. These men in the Defense Commission and these other agencies are not bureaucrats, they are simply engaged in a sincere effort to serve our country in its time of need, and the ability and self-sacrifice which they are bringing to the people of this nation should be recognized and honored accordingly.



Washery at right, coupled with old tipple unit gives preparation flexibility

UTAH FUEL'S CASTLE GATE PREPARATION PLANT Meets Changed Market and Stoker Coal Requirements

Convinced that the future of the western coal industry, at least, lies in the scientific betterment of the small sizes of raw coal to meet the exacting requirements of modern coal-burning equipment, Utah Fuel Company this year completed construction of an up-to-the-minute washing plant at a cost of some $350,000.

The plant was designed and built as a complete unit, integrated into the design and functions of the existing raw coal tipple. Gravity separation, scientific dewatering and drying, and blending of sizes gives needed control over cleanliness, ash and moisture percentage and size make-up. Factors considered in building the plant and results of recent extensive tests of its operation are discussed in the accompanying article by Mr. Claude P. Heiner, Assistant General Manager of the company.

\+ + +

OVER the past dozen years market demands for Utah coal have reversed themselves completely. Prior to and during 1929 the market consumed high percentages of "prepared" sizes (plus 1⅝ in., nut, stove and lump) at good prices, while slack sizes (minus 1⅝ in.) were considered waste products and were taken mostly by industrial consumers at very low prices. Since 1929 a good market for slack sizes has developed and slack prices have risen, while "prepared" coal sales have shrunk in volume and prices have declined.

Formerly there was a moderate amount of preparation—handpicking—for the coarser sizes but simple screening only for the slack. The few small underfeed stokers installed showed great improvement over hand-firing even when using this poorly prepared slack. Therefore, special preparation of this coal was not considered necessary. Industrial plants seemed little interested in improving coal quality because of the low prices prevailing for their fuel. With all users of slack coal, the lack of such things as proper sizing, cleanliness, and suitable clinkering tendencies were generally accepted as inherent with coal.

Substitute Fuels Register Substantial Gains in Utah Since 1929

The great development and extension of natural gas lines started in the Rocky Mountain States in 1929, and thereafter Utah coal has been supplanted to an increasing extent by natural gas. This has applied to other coal-consuming centers served by Utah mines, as well as to the State of Utah and to both domestic and industrial consumption. Also the influx of low-priced fuel oil over this same period, as well as the increasing sales of oil burners, particularly in northern California and the Pacific Northwest, has taken a sizeable slice of the former market for Utah "prepared" coal.

Increased Stoker Sales Brought Trend to Smaller Sizes

The inroads of substitute fuels and the demand for convenient, automatic heat, has therefore meant the loss of much of the market for "prepared" sizes of coal in favor of the smaller sizes. The latter could meet the requirements of automatic firing, whereas the prepared sizes could only be hand-fired. This change to smaller sizes was brought on directly by the increased stoker sales, as shown in Table 1. (Sales within the Intermountain country lead the country as a whole because of suitability of coals.)

To illustrate the effect of these changes on the coal actually shipped from leading Utah mines, the author has gathered data from various sources as shown in Table 2, which is thought to be indicative of the changed situation as it affected coal shipments.

The over-all story from these figures is that there has been a change from a slack surplus 10 years ago to a point where some mines are crushing fully half their large coal to slack to meet market requirements.

(Table 1)

Year	*Total Number Units Sold**
1923 through 1930, avg. yearly sales	1,383
1931	12,121
1939	104,289
1940 (estimated possible)	125,000

*Source: Monthly reports of the U. S. Dept. of Commerce. Compiled by Committee of Ten—Coal and Heating Industries.

(Table 2)

Year	*Percent of Shipments Under 15/8-in. Size*	*Surplus or Shortage of Mine Run Slack*
1929	45 percent	Balanced Shipments
1930	40 percent	Surplus Slack
1931	48 percent	Mine Run Shortage, Crushed Coal
1939	70 percent	Mine Run Shortage, Crushed Coal
1940	(Est. 72 percent on basis of first 10 mos.)	Mine Run Shortage, Crushed Coal

(Table 3) SCREEN ANALYSES, CASTLE GATE MINE, 1 x 0-IN. SLACK
Carload Shipments, Percent—¼-in.

	Average Percent	*Maximum Percent*	*Minimum Percent*
181 Cars	33.7	45.0	17.5
Cars Loaded—			
January 1939	...	39.7	20.5
October 1938	...	33.3	26.4
August 1938	...	43.3	22.5
May 1938	...	36.0	27.0
April 1938	...	44.0	20.5

(Table 4) COMPARISON, CHARACTERISTICS OF LABORATORY SAMPLES
CLEAN 1 x 0-IN. CASTLE GATE STOKER COAL AND IMPURE SAMPLES

Description	*Dry Basis Percent Ash*	*Ash Characteristics Softening*	*Fusion*	*Dif.*
No. 1 100 percent clean coal, hand picked	4.5	2175°F.	2375°F.	200°F.
No. 2 95 percent clean coal, 5 percent boney coal	5.6	2165	2220	55
No. 3 90 percent clean coal, 10 percent boney coal	6.6	2380	2380	0
No. 4 90 percent clean coal, 10 percent sand rock*	15.8	2280	+2585	+305

*Cleaned to remove basic material.

Requirements for Stoker and Slack Sizes

This present-day market for stoker and slack sizes demands that the coal be:

1. Suitable, as regards burning and clinkering characteristics.

2. High quality, low-cost fuel; desirable sizing, dustlessness.

3. Uniform, as to successive shipments.

These requirements vary somewhat with the type of stoker and particular use for the coal, but in general both domestic and industrial installations are concerned with the same characteristics.

As an illustration of the difficulty encountered in satisfying these preparation requirements by simple crushing and screening, the results, representative of a two-year study, are submitted in Table 3.

The lack of control in size make-up was found to be a source of frequent customer dissatisfaction. Dealers and consumers alike preferred uniformity in sizing. Likewise, ash percentage of raw coal shipments over this period varied widely. The maximum ash content of any single car amounted to 12.0 percent, while the minimum amounted to 5.6 percent, the average being about 6.2 percent. While at first glance moderate swings in ash content do not seem of great importance, in the case of coal from the Castle Gate seams they affect the desirability of the coal for stoker firing materially. Impurities here are detrimental to the fusing point, as shown in Table 4.

Characteristics of Clinkers from above samples in Domestic Stoker:

No. 1. Hard, solid, satisfactory.

No. 2. Somewhat glassy, dangerous.

No. 3. Glassy, dangerous.

No. 4. Dusty, bulky, unsatisfactory.

Boney Coal and Roof Rock in Mixture Yield Dangerous Clinker Types

Clean coal of the ash analysis and characteristics shown in the table (No. 1 above) was found suitable for domestic as well as most industrial plants, while mixtures with either boney coal or sand rock (or roof rock) (No. 2, No. 3, No. 4 above) were quite undesirable, particularly in industrial furnaces. Relatively small additions of boney coal (2 percent to 5 percent) with the clean coal, causing but slight increases in total ash percentage (0.5 percent to 1.1 percent) were found to yield dangerous clinker types even in domestic stokers. This also applied to admixtures of ordinary roof rock with the coal, the exact clinkering characteristics depending on the concentrations of lime or silica in the roof rock and the amount intimately mixed with the clean coal.

It was recognized that comparatively few cars shipped were excessively poor as regards either ash or size distribution. Where retail dealers and industrial plants kept large

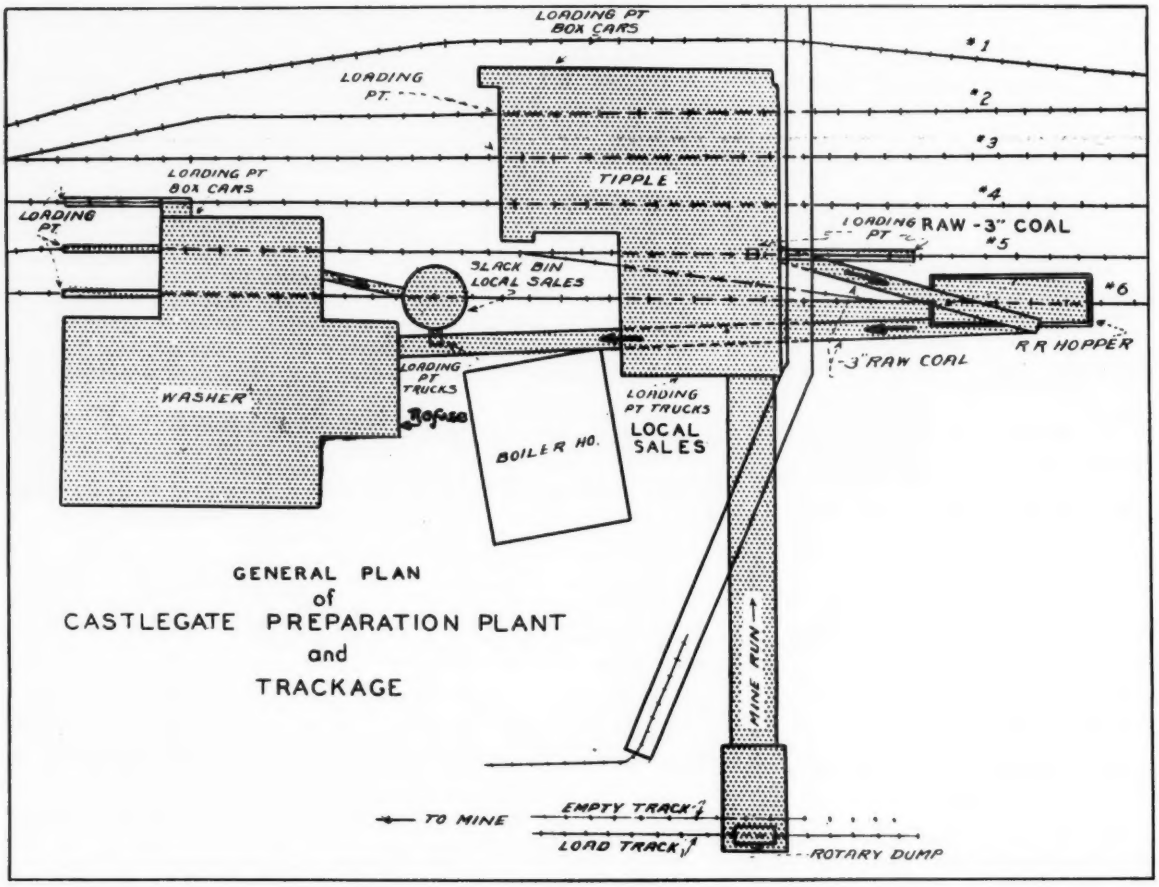


Figure 1

stocks of coal and could mix shipments so as to hold an average grade, only occasional trouble was encountered. But most consumers were not so fortunate, with the result that many complained of wide variations in coal quality.

Utah Fuel's Plant Built to Meet Stoker Coal Requirements

The preparation plant of Utah Fuel Company at Castle Gate, Utah, was redesigned and built primarily to satisfy this changed coal market and to more fully meet these new and exacting stoker coal requirements. It was realized that control over the final product as regards cleanliness, ash and moisture percentage and size make-up could be accomplished only by gravity separation to remove impurities, separation into sizes, scientific dewatering and drying, and blending of sizes. The idea that there was somewhere in all Utah coal mines a workable body of clean uniform coal, requiring only simple extraction and screening to make it satisfactory to all consumers, had proven to be only wishful thinking. Experience had shown that no close control of the product could be accomplished by changing mining methods, or by simple handpicking and screening as in the conventional tipple.

The plant was also designed to handle and prepare coal from other nearby mines owned by Utah Fuel Company, in particular the Clear Creek No. 3 mine, located at Clear Creek, Utah, some 38 miles by rail from Castle Gate. While somewhat lower in rank than Castle Gate coal, this coal has a high ash fusion point and very free-burning characteristics. Comparison of the two coals is about as follows:

Both of these coals would be classified as being easy to clean by modern jigging methods. Since they behave differently in most furnaces, a considerable market has been developed for each of them.

The Clear Creek coal is transported to Castle Gate over the tracks of the D. & R. G. W. Railroad for a processing. The Clear Creek coal is prepared during times when the Castle Gate mine is idle.

Surface preparation at Castle Gate was accomplished from 1928 until February 1940 entirely in an Allen and Garcia tipple. This plant included screening, crushing, and handpicking arrangements as well as oil-treating

	Percent Ash Dry Basis	*±.05 S. G. at 1.50 Percent*	*Ash Fusing Temp. °F.*
Castle Gate No. 2 Mine:			
Raw Coal, 3 x 0-in.	6.6		
1.50 Float, 3 x 0-in.	4.9	2.5	2230° (1 x 0-in.)
Clear Creek No. 3 Mine:			
Raw Coal, 3 x 0-in.	9.1		
1.50 Float, 3 x 0-in.	5.1	0.7	2510° (1 x 0-in.)

facilities. This unit handled as much as 2,500 tons in a seven-hour shift.

Flexibility of Plant Operation Provided

In the plan for modernization, this older plant was carefully integrated into the design and function of the mechanical cleaning plant. Although two separate structures are used, the two units are designed to operate together in processing of Castle Gate coal. Flexibility was desired so that each unit might operate separately if necessary. Under the present arrangement the following operations can be carried out:

1. Coal from Castle Gate mine can be prepared:
   a. Plus 3-in. sizes handpicked in tipple.
   b. Minus sizes cleaned mechanically in washery.
2. Tipple can be run on Castle Gate coal independently of the washery:
   a. Plus 3-in. sizes prepared as above.
   b. Minus 3-in. raw coal sizes can be loaded for storage (for later processing through washery) or for shipment.
3. The washery can be run independently of the tipple, using minus 3-in. coal from other mines (generally Clear Creek coal) or from Castle Gate coal storage.
4. It is possible (though this has not yet been necessary) to run the tipple and washery concurrently but on different coals without mixing the two.

Primary Screening at 3-in.

In processing Castle Gate coal the raw product is delivered by tram from the mine located some three-quarter-mile up-canyon from the preparation plant. The 4.2-ton mine cars are weighed and rotary dumped into a chute and discharged into a 48-in. apron feeder, which in turn discharges onto a 48-in. belt conveyor. The latter conveys and elevates the coal to the head of the main screen in the tipple onto which it is fed by a reciprocating feeder. The main screen classifies the coal into the minus 3-in. size for the washery and the plus 3-in. size for handpicking. All of the plus 3-in size may be crushed and added to the washery feed. (See accompanying combined flow sheet.) Nominal capacity of the tipple is 360 tons per hour, mine-run coal.

Two classes of pickings from the plus 3-in coal are separated. The pure rock and boney material is conveyed to a refuse bin and discharged at intervals into railroad cars for disposal. The coal containing bands of impurities is crushed to minus 3-in. and added to washery feed.

Car dump hopper, showing coal from Castle Gate tipple dropping through grate bars into pit.

Plus 3-in. sizes include 3-in., 8-in. and 10-in. lump, 8 x 3-in. and 10 x 3-in. stove. These may be loaded into either open or box cars.

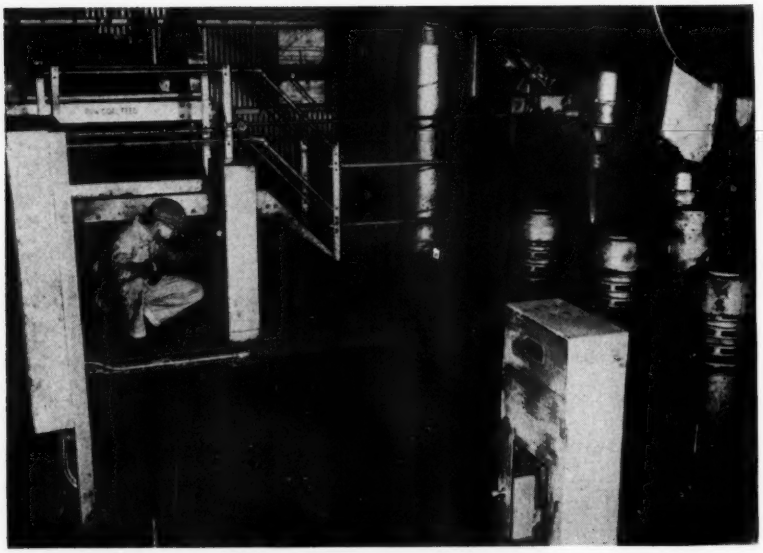
A portion of either 1 x 0-in. or 1⅝ x 0-in. raw coal may be screened from the 3 x 0-in. raw Castle Gate feed-to-washery on a section of the main tipple screen and loaded directly into open railroad cars by means of a screw conveyor and magnetic pulley. Note Fig. 1 showing the general plan and trackage with loading points.

The 3 x 0-in. raw coal from the tipple is conveyed to a 250-ton railroad car dump hopper which acts as a surge bin for Castle Gate coal—also as a receiver for raw 3 x 0-in. coal from storage, from Clear Creek or other mines. From this point the flow is the same regardless of point of origin of the coal processed. Feed to washery is maintained at 250 tons per hour.

Dump Hopper Serves as Surge Bin and Raw Coal Reservoir

Experience has proven this dump hopper to be a valuable combination of surge bin and raw coal reservoir. When processing Castle Gate coal from the tipple, the hopper is filled through a central discharge chute so placed as to allow maximum filling of the pit as well as to allow passage of rail-

Night view of car dump hopper, showing cars of Clear Creek 3 x 0-in. coal being dumped



Link-Belt Simon-Carves wash box

road cars beneath the chute. When filled to capacity, it assures the washery of a steady feed of raw coal for one hour. Also, often recurring delays in mine-car deliveries to the tipple, temporary tipple delays, etc., are satisfactorily "ironed out" by the hopper. Uniformity of feed has been found to be of fundamental value in performance of the washery.

Washing Minus 3-in.

Discharge of raw 3-in. coal from car dump hopper is regulated by a variable throw reciprocating feeder and adjustable gate. The raw feed is conveyed to the washery by a conveyor belt, inclined about 18° between 216′ horizontal centers. The raw coal leaves the belt by chute directly to a model 5044 Link-Belt Simon-Carves, 2-compartment, 5-cell wash box. Primary and secondary refuse enters a refuse bin by chute and flight conveyor. The refuse bin discharges by an undercut gate into 8-ton International trucks for disposal.

The washed coal is separated into the following sizes on "flexible hangar" classifying screens:

3 x 1⅝, 1⅝ x 1, 1 x 3/16 and minus 3/16-in.

From the classifying screens and after passing under suitable sprays, the 3 x 1⅝-in. and 1⅝ x 1-in. sizes are conveyed to any one of 3 loading booms, or to a box car loader. In addition, the latter size may be elevated to one of the three 125-ton blending bins. Surplus of either size is crushed to 1 x 0-in. by a Link-Belt Double Roll Spring Relief Crusher (type "C") later being rescreened on a Symons-Nordberg double-deck vibrating screen to yield 1 x 3/16-in. and minus 3/16-in. sizes. The rescreened products then join the similar heat-dried sizes to be conveyed to separate 125-ton blending bins.

Heat Drying on Small Sizes

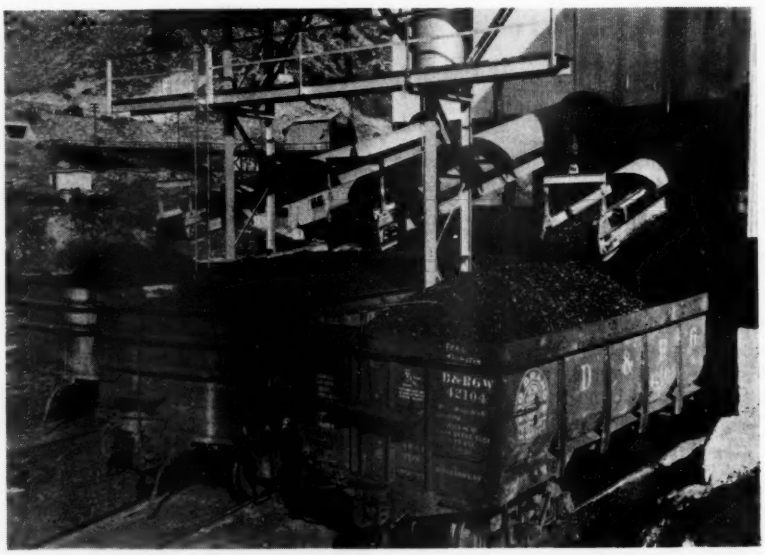
The 1 x 3/16 in. wash box float coal is heat dried in Link-Belt screen dryer to less than 4 percent surface moisture before being joined by the crushed and rescreened product. Temperatures of hot gas above the dryer bed are held at about 600° F. with gas discharge temperature approximating 130° F.

The minus 3/16-in. coal from the wash box is sluiced to a primary cone for separation and removal of "slurry" sized under 28-mesh. The 3/16 x 28-mesh size is then transferred by Luhrig type dewatering elevator to a 48-in. Elmore dryer using either 3/64 or 1/16-in. screens. The Elmore dryer reduces surface moisture to around 7 percent, after which the product enters the Link-Belt No. 1003-30 Roto-Louvre dryer for removal of additional surface moisture. Hot gas inlet is held under 800° F. and exhaust gases discharge at about 120° F. The heat dried product passes through a shaking chute to bucket elevator boot where it is elevated to 125-ton blending bin.

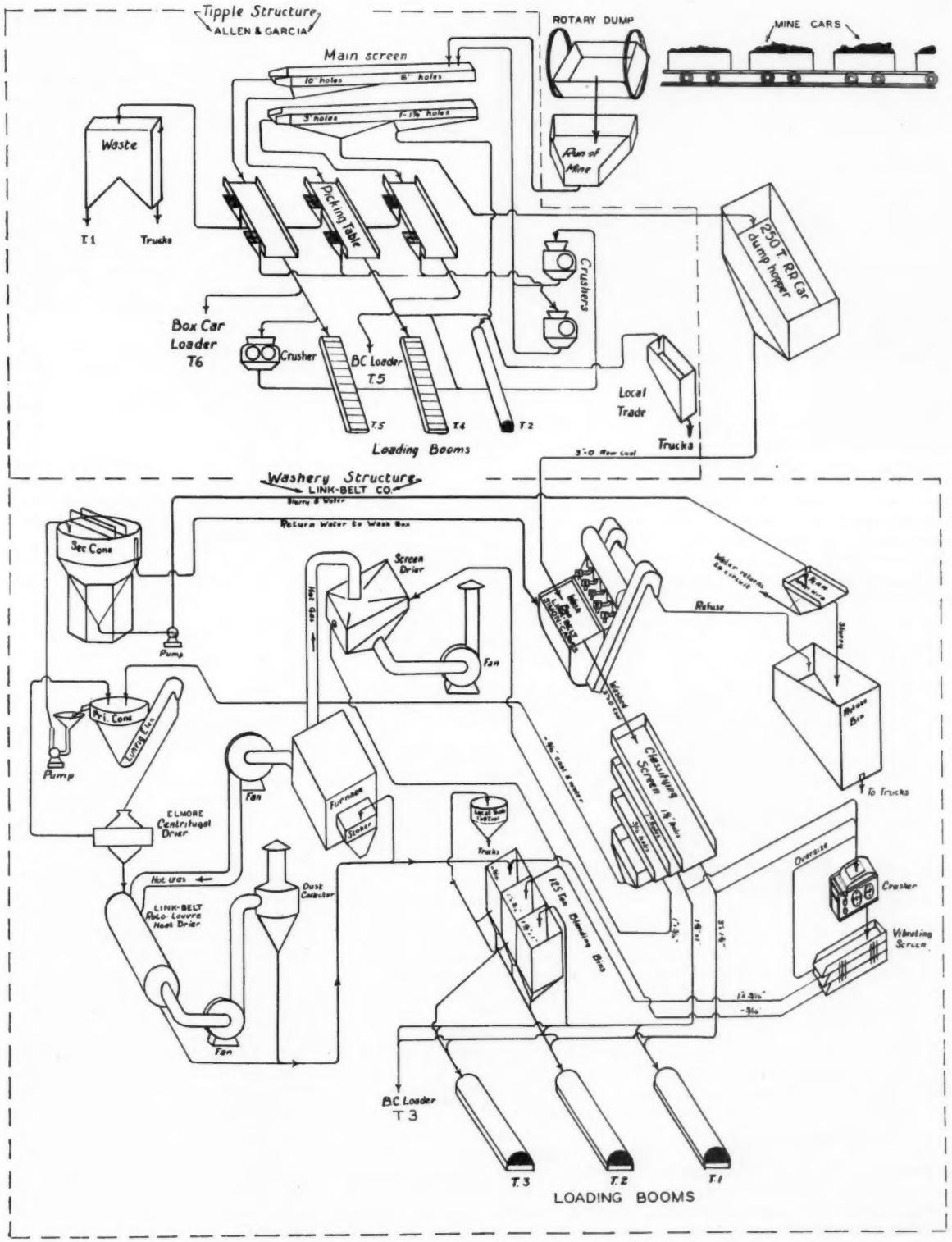
Primary cone overflow passes to secondary cone for separation of water and minus 28-mesh slurry. Slurry is then pumped to wedge wire dewatering screens for further dewatering before joining coarse wash box refuse for truck disposal in nearby gulches. Surface moisture on slurry is here reduced to about 30 percent. Overflow water from secondary cone returns to wash box.

Blending Plant Gives 5 Percent Size Control

The blending plant consists of three 125-ton bins with discharge controlled by rack and pinion gates and Link-Belt PIV Speed reducers. Percentage control of size mixtures can here be held within 5 percent. Also included are facilities for spraying



Loading booms in operation at Castle Gate washery



Flow sheet of the combined preparation plant

Truck receiving refuse

high wax oils or other heavy oils on all sizes. Viking dual system is used for the latter. Daily sampling routine is followed to show wash box performance, ash and moisture on raw coal and on washed and dried sizes. Constant control of major operations is thus maintained.

The combined plant allows loading combinations as follows:

1. 3 x 1⅝, 1⅝ x 1, and 1 x 3/16-in. sizes can be loaded from washery into open cars or box cars. Tracks 4, 5 and 6.
2. 1⅝ x 0-in. or 1 x 0-in. washed and dried stoker sizes can be loaded into open cars. Track No. 5.
3. 3/16 in. x 28-mesh washed and dried fines can be loaded into open cars. Tracks Nos. 5 and 6.
4. 1 x 0-in. washed and dried stoker coal can be loaded into trucks for local sales from a 50-ton bin.
5. Plus 3-in., 8-in. and 10-in. lump, also 8 x 3-in. and 10 x 3-in. stove can be loaded into open or box cars. Tracks Nos. 1, 2 and 3. These sizes can also be loaded into trucks for local sales.
6. Raw 3 x 0, 1⅝ x 0 or 1 x 0-in. can be loaded into open cars on tracks Nos. 5 and 6.

Plant Results Gratifying

Results to date with this modernized preparation plant have been gratifying. Particular attention is directed to the satisfactory improvement when processing Castle Gate coal in: (1) wash box operation; (2) drying of 3/16 in. x 28-mesh size; (3) monthly combined plant loss; (4) cleaning by handpicking of plus 3-in. coal.

(1) *Wash Box Performance:*

Month, 1940	1.50 float material in refuse—average	
	Primary	Secondary
March	38.4%	43.0%
October	12.7	32.5

	Ash Content washed coal Avg. 3 x 0-in.	Ash Content Plant feed
March	5.28%	6.5%
October	5.18	6.9

Of particular value in obtaining this satisfactory performance the following have been noted:

a. Steady feed made possible by car dump hopper, as noted previously.
b. Consistent screen analysis of raw feed, obtained by holding to single practice in handling 3 x 0-in. size in tipple.
c. Maintenance of relative control of rock and boney material in raw feed.

(2) *Drying Performance*—3/16-in x 28-*mesh size:*

Average to Oct. 31
Surface Moisture
Minus 3/16-in. portion of Raw Plant Feed
3.63%

Dried discharge from Roto-Louvre
2.51% using 1/16-in. screen in Elmore Dryer

2.80% using 3/64-in. screen in Elmore Dryer

Another advantage of steady washery feed and raw coal screen analysis shows up in the excellent performance of the Roto-Louvre dryer. Also, 3/16-in. x 28-mesh coal in primary cone assures steady feed to Luhrig dewatering elevator, to Elmore and Roto-Louvre dryers. Tests have shown that recirculation of slurry through the Elmore causes moisture content of the Roto-Louvre discharge to vary considerably—4.3 percent to 6.7 percent on daily averages.

(3) *Preparation Plant Loss:*

Month, 1940	Total Loss Based on Raw Coal Mined
January	3.4%
March	6.4
September	5.5

Handpickings wasted; after start of washery in February 1940 part of handpickings crushed and sent to washery. Loss percentage controlled partly by amount of nominally minus 28-mesh material recirculated through Elmore dryer.

(4) *Cleaning of Sizes Plus 3-in.* Prior to construction of washery only one shaking picking table was available for a maximum flow of 75 tons per hour 8 x 3-in. size, whereas two tables are now used regularly. Formerly 12 to 14 handpickers were crowded to one table and could not do a satisfactory cleaning job, the two tables now giving adequate room for proper picking.

Operation of the washing and blending plant is carried on by six men exclusive of weighman, car droppers and dumpers. Three separate crews have been trained for key positions and operations to date have run smoothly.

Successful Operation Due to Cooperation of Mine Staff

Successful operation of the plant is in large part due to the whole-hearted cooperation of the mine staff, including W. D. Bryson, general superintendent; William Moorhead, mine superintendent; Earl Warren, master mechanic; Charles Houghton, preparation foreman; Carl S. Westerberg, preparation engineer, and the fine organization they have perfected.

The purpose of the new and redesigned plant was to do a better job of preparing all sizes of coal from both Castle Gate and Clear Creek mines. That this has been accomplished is shown by the flexibility of operation and control of product found possible in experience to date.

Detailed design and complete construction of the washing and blending plant was given to Link-Belt company, and its coal preparation department. Objectives only were outlined and details of former plant supplied by Utah Fuel Company so as to allow redesign to integrate into the function and design of the former plant. The result has been mutually satisfactory to both concerns.

NEW DEVELOPMENTS in *Placer Mining* and *Recovery of Gold**

By

C. M. ROMANOWITZ

H. A. SAWIN

Yuba Consolidated Gold Fields

C. M. Romanowitz

FUNDAMENTALS of placer mining have remained the same since the days when man first found the shiny bits of metal in a stream bed and saved them because they were pretty. Demand and scarcity gave them a barter value; malleability added utility, and the first gold jewelry and implements were created. There is no way of determining which came first, but both certainly antedated gold coin by ages. Man's high regard for gold is of long standing and deep-seated.

Basic Principles of Placer Mining

Back now to basic principles. These include location, excavation, and separation. Human intelligence guided the first miners in their search, and experience helped limit the range. Placer deposits exist only because of erosion and glacial action, and it is easy to imagine the ancients limiting their search to shallow stream beds, bars and nearby benches. Today, where do we look for placer gold? Stream beds, bars, benches still; but experience directs us also to hidden gold in channels, bars and benches long since covered, by natural processes, with overburden.

Drilling equipment and shafting methods need not be described here, but the importance of honest investigation and proper logging of a placer property must not be overlooked nor underestimated, as is sometimes done by newcomers in the industry.

Excavation, the second principle of placer mining, was at first a simple process. Man either picked up bright nuggets with his fingers or scooped grains of gold from natural riffles in stream beds. Later came crude scoops and shovel-like tools. Through the ages he advanced mechanically to modern methods; streams of water, under high pressures from natural heads and heads boosted by mechanical means; drag-line buckets and steam shovels; bulldozers and tractors; huge bucket-line dredges; any mechanical equipment to save his muscles and increase volume. Man's intelligence, in recent times, has created machinery of great capacity and strength, and his desire for more gold has directed those machines in the excavation of the hidden channels, bars and benches of ancient placers.

Recovery, the third principle, at first was the picking up of bright pieces; but man's mind probably very early noticed the gold-collecting action of natural riffles and the tendency of the heavy gold particles to settle in depressions and cracks. A short step it was, after fashioning a scoop from a flat river stone, to the construction of an artificial channel through which to run gravel, thereby helping the natural current to segregate and collect gold. Only our imagination can guide us in trying to measure the period of time required to build that first sluice, but man's intelligence won for him again, and sluices, as we know them, are ancient implements. Students of mythology tell us that Jason's "Golden Fleece" was a sheepskin, a riffle used for gathering gold in placer mines of Colchis. Sluices, we still use with riffles and undercurrents of various types, but by improved arrangement man has made modern placer mining pay dividends from low-grade deposits. Natural recovery methods, adopted by man, were improved through his discovery of classification and his invention of screening devices. Someone also noticed that heavy particles settled through live beds of sand and water. Here was the beginning of the jig, a tool which placer miners have claimed and use today.

To these three ancient principles we add a fourth, tailings disposal, which must have made its need felt at an early date. Small workings required little room for tailings, but, as larger deposits were worked, it became necessary to give more study to the disposal of tailings and to handle them in such a way as not to hamper mining operations. Often water courses carried away debris from shallow works, but public opinion today is a force which can and has affected placer mining, notably hydraulicking in California during the latter part of the 19th century. Public opinion asks why tailings cannot be hidden or covered. Placer mining, a world-wide and important industry which produces new wealth for the use of man, is often hampered by sincere but uninformed outsiders, who fail to balance the value of new gold against other factors, such as surface destruction and stream roiling. Modern placer miners appreciate the fisherman's and farmer's objections to stream roiling, and are ready to cooperate in every reasonable way.

Herbert A. Sawin

* Presented Annual Metal Mining Convention, Western Division, The American Mining Congress, Colorado Springs, Colo., September 16-19, 1940.

Resoiling Problems

Surface destruction goes with most mining, and it is the placer miner's problem to overcome unreasonable objections to his use of land for mining. Resoiling can be accomplished (on comparatively small operations) in areas where sufficient top soil and ideal conditions exist. Ordinarily the land recovered does not add to the total arable area in any appreciable manner, because millions of untilled farm acres are idle in placer mining sections of the country. In California, particularly, during the last quarter of the century, resoiling after dredging has been attempted, but the results have had no practicable value except in small isolated instances. Leveling of tailings by mechanical means is accepted as the best method for improving the appearance of the rock piles, if conditions warrant the additional expense, but actual resoiling is a problem dependent upon the presence of sufficient overburden or fine material, water conditions, contour of bedrock and other conditions. A long paper can be written on this subject alone.

Dredge Developments

With this background it is interesting to note improvements in placer mining methods during the period of the past two decades. Principles, we know, are identical with those of the past. Methods today take advantage of every tool that can be adapted by man's ingenuity, and in some instances new tools have been devised. About 1912 a floating washing plant was built and shipped to Siberia. It incorporated the several units of a placer dredge, but had no digging unit. It was to have been fed by a steam shovel, or drag line, on the bank ahead of the pond, but it evidently did not work as expected and was rebuilt to incorporate a bucket line following standard practice of the dredging industry, which was reaching its first peak at about that time. Single bucket excavators had been tried and discarded, largely because of disadvantages due to intermittent feeding of gravel and perhaps also to the crudity of the shovel unit. After a lapse of about 20 years the idea was revived and many such plants have been built and operated during the past six years, particularly in Alaska, California, and other Western states. Drag-line units today mounted on crawler tracks are flexible, mechanically reliable and sufficiently continuous in operation to be used in feeding a floating stationary plant. The problem of intermittent feeding has been overcome to a point where some drag-line operators are successful producers when conditions are right for this type of operation. Recovery units have been enlarged to suit the volume of gravel supplied, and such plants have gradually assumed the characteristics of bucket-line dredges, particularly as to table area, water supply, stacking and working space. Many small areas of ground usually shallow have been mined by drag-line units, and many articles dealing with their operating costs, recoveries and yardage have been published. The adapting, by drag-line dredgemen, of bucket-line experience led to hulls of proper size, providing stability and a safe freeboard; and to equipment having the capacity to do a recovery job, not just one of excavating. Cheapness due to small size and light weight induced many men to try drag-line dredging. Experience has taught the successful operators to apply the tried principles of dredging. Proper prospecting and evaluation have led to the construction of equipment designed for the job.

As an indication of improvement in equipment and methods, drag-line dredge operators in California, according to the figures given out by the San Francisco office of U. S. Bureau of Mines, increased average recovery per yard from .168 in 1938 to .191 in 1939. The 1939 volume was 31,618,000 cubic yards, and represents the material handled by 109 plants operating on 142 properties. The distinct advantage offered by such plants is

Cripple Creek operations, U. S. Smelting, Refining and Mining Company near Fairbanks, Alaska

portability. On comparatively small and shallow properties, with soft bedrock and in narrow canyons, or on otherwise restricted ground, drag-line dredges have been successful in mechanical operation, but not always profitable, due to high costs and lost running time.

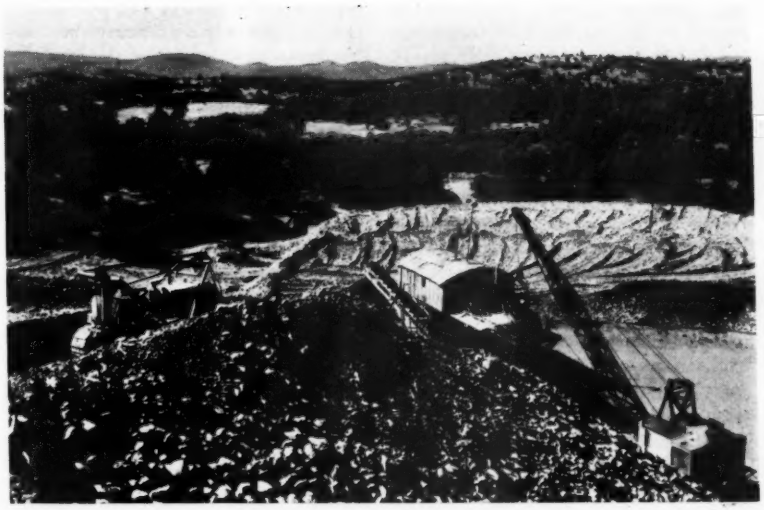
Operators today in California use buckets ranging in size from ½ to 7 cu. yds. Larger buckets have been considered, one of 14 cu. yds. capacity has been proposed for a Nevada property. Most operators claim a digging-dumping cycle of 35 seconds, but with larger buckets this cycle approaches 45 to 50 seconds, and represents only a cycle for the time of feeding gravel to the hopper. A time cycle based on total operating time, which averages about 17 hours per day, would probably be between 50 and 60 seconds.

Many drag-line operators in the western United States, Canada and Alaska have opened up new works on small placer properties which would have been impossible under other operating methods. Many of these properties have been discovered and developed by drag-line operators in the face of discouraging reports by mining engineers and geologists. Much credit is due to them for greatly extending the scope of small placer mining operations. In some cases the competition offered by drag-line dredges has led to the development of larger areas for successful bucket line dredging which might otherwise have gone undeveloped.

Becker Hopkins Dredge

A comparatively recent development in dredging is the Becker-Hopkins dredge, two of which have been constructed and are being used successfully in Alaska. This type of equipment incorporates successfully a single bucket excavator. In early days of dredging, in California, attempts were made to substitute a single bucket on a digging boom to be used instead of a bucket line. Early attempts were unsuccessful and placer miners have made no attempt until very recently to use this idea again. The boom and bucket on a Becker-Hopkins dredge are integral and material elevated by the bucket slides down the boom, which is trough-shaped and telescoping. From the boom the gravel slides into the screen aided by a large amount of water supplied to the boom at the bucket. This water comes from a tank located on the bow-gantry at a point close by the bucket in its maximum elevated position. In digging, the bucket is dropped, almost vertically, at the rear of the well in the hull and is pulled by steel cables in a horizontal position along the bottom of the pond to a point below the bow, from where the boom and bucket are elevated in a radius to a point where, aided by flushing water, the excavated material slides down to the screen. These dredges do not swing on a spud, but are operated against a square face, being moved sideways on the pond by lines which also hold the dredge in digging position. These dredges have been developed to meet requirements for working properties such as have been mined by drag-line outfits, and offer the advantage of lower investment, as the need for drag-line excavator is eliminated. All the component parts for the operation are mounted on one hull. In areas subject to rising water, this is important, as the complete unit floats and there is no drag line nor other digging unit to be flooded out. At the present time it is thought that these dredges can be operated economically to depths of 25 ft. below water level. The dredges now in use have 1 cu. yd. buckets and can handle about 1,800 cu. yds. of material daily, operating two 10-hour shifts.

Becker-Hopkins dredges offer advantages over drag-line dredges in that the bottom is dug systematically and cleaned up in a thorough manner, each drag of the bucket moving adjacent to the previous excavations. Hard bedrock can be dug because of the concentrated power available; and in moving boulders, a Becker-Hopkins bucket has the advantage because of the great leverage available. Boulders are actually dug out of a bank from the underside rather than being pushed into a bank from the front. These advantages have been proved in practice and are not theoretical. Equipment on a Becker-Hopkins dredge, other than the digging bucket and boom, is similar to that on a standard-type dredge.



Tractor and bulldozer moving tailings and bringing material within reach of drag-line bucket, Angels Camp, California

Increasing Use of Tractors

Coupled with practically every placer mining job today is found one or more caterpillar-type tractors. The great variety of work which can be done with a "cat and dozer" was soon obvious to placer miners. It it interesting to note that the bulldozer which we know today was first developed in the dredge fields at Natoma, Calif., about twenty-five years ago and was used there to level tailings in an early attempt to resoil. One of the operating companies' tractors was converted into a bulldozer similar to those used almost universally today and used successfully in leveling. Practically every dredging operation has such equipment and, aside from hauling and general use, they are frequently found moving material, doing work which can be classed as excavating. Tractors and carryalls, or tractors equipped with bulldozer strip overburden ahead of drag lines and shovels. They level tailings, and cover tailings with overburden on some operations where such work is of importance. Stripping is often the solution for putting a small property on a paying basis, making it possible to mine only the richer gravels. Stripping is not new to mining, but modern dirt-moving equipment is helping to reduce costs for placer min-

ers. There are mines where gravel is pushed to the ore-chute by bulldozers and fed to classifying and gold saving equipment from stockpiles conveniently located near a stationary plant. There are many surface workings too shallow for floating equipment, some of which were once mined by hand, that offer opportunities to men who adapt "cat and dozer" tactics to excavating.

In Alaska there are many operations combining the use of a long sluice, drag-line and bulldozer equipment. Sometimes the sluices are at ground level, taking advantage of the natural slope, and pay-dirt is moved to the upper end by bulldozing. Tailings at the lower end are moved away and stacked by a drag line bucket. On other operations the sluices are elevated and, after the material is brought to the head by bulldozing, it is elevated by drag line to the sluices. Tailings are distributed at the lower end by gravity, and from time to time the sluices are moved as operations require.

By the use of large carryalls and tractors it was possible to move at a comparatively low cost a good-sized hill of sand which obstructed the operations of a 6 cu. ft. dredge owned by Lancha Plana Gold Dredging Company, near Camanche, Calif. By removing the hill and leveling ahead of the dredge it was possible to continue normal dredging operations on ground that could not otherwise have been dredged. Fisher and Baumhoff also did similar work on the operations at Warren, Idaho. On another dredging operation in California, near La Grange, bulldozers have been used for the removal of overburden at high points ahead of dredging, thereby enabling a 12 cu. ft. dredge to operate against a bank which, while higher than usual, can be dredged. Without bulldozing, much of the dredging on this particular property would have been impossible with the dredge as furnished.

Use of Portable Washing Plants

A type of operation which is credited with success, particularly in California, includes the use of a portable washing plant equipped with trommel and centrifugal bowls or jigging equipment. A comparatively small volume of water is used for screening and recovery purposes; the excavation, however, is kept as dry as possible. While such plants are limited in capacity, they have been successfully operated on properties where values are high. One operator strips overburden to a depth of about nine ft. and washes only gravel deposits lying beneath the overburden to a total depth of about twelve ft. In other words, about three ft. of gravel, averaging 80 to 90 cents per cubic yard, is put through the screening and recovery units. It is possible in an operation of this kind to follow the pay-streak. As the excavation is dry, lean gravel can be avoided and rich pockets and cracks can be cleaned up by hand if necessary. Limited capacity is offset somewhat by the fact that only gravel of high value is washed. Portability and closely controlled excavating because of the dry hole are advantages.

Dry-Land Placer Operations

Skipping over the wholly dry workings, where vanners and air circulation in connection with shaking screens are used, there is still another type of so-called dry operation which has met with some success in the West. In Montana a huge dredge-like plant was built and mounted on caterpillar tracks. It was used with some success in much the same manner as a floating washing plant, the gravel being fed to a hopper by drag lines. The screening, recovery and stacker units are much the same as those used on standard dredging operations, with water for recovery units piped to the plant. Several plants of similar design have been built or considered for use in areas lacking sufficient water to float a dredge. There is considerable merit in the idea, but careful consideration must be given to the problem of water supply for gravel washing and gold recovery. The use of crawler-type tracks, such as are used on huge shovels, simplifies the design and use of such equipment, and many men are intrigued with the prospects for placer mining by this method. Plans for maneuvering such heavy equipment on dry land to best advantage require careful study, and values must be sufficiently high to offset lost time required for moving and new set-ups. A dry-land placer operation in Wyoming has been reported as successful and in this case the bedrock was sloping. Operations were carried out on bedrock working from the lower end. This operation was given the careful thought necessary and was carried out successfully because of the thorough manner in which it was worked.

Progress in the Use of Jigs

Mr. P. Malozemoff, metallurgical engineer with Pan-American Engineering Company, has kindly cooperated in furnishing information concerning the use of jigs in placer mining. His company has been a leader in the modern use of jigs and there are several published papers which go into considerable detail. Jigs were first used in California on the Yosemite dredge in 1914. These were made by Mr. J. W. Neill, whose jigs were also used on several of the Natomas Company's dredges for many years. Yukon Gold Company made use of Harz jigs in their tin dredging operations, and because of their success eliminated tables and completely equipped dredges with jigs. Afterwards Bulolo Gold Dredging Company made tests with jigs and equipped one of their New Guinea dredges with Bendelari jigs. Soon after they developed their own jig, which is in all essential elements identical to the Pan-American placer jig used on many dredging installations today. We want to recommend to those interested a paper entitled "The Application of Jigs in Placer Mining Operations," by Mr. D. N. Vedensky, which was presented at the Eleventh Annual Mining Institute, College of Mines, University of Washington, Seattle, January, 1938.

Two 6 cu. ft. Yuba dredges, operated in Montana by Winston Brothers and Perry-Schroeder Mining Company, are equipped with Pan-American jigs for primary gold saving. On the Perry-Schroeder dredge, as an interesting side-product, the jigs recover sapphires and garnets in paying quantities; most of those saved are suitable for mechanical use, but some are of gem quality. Yuba No. 19 is a completely jig-equipped dredge, and several of the Natomas company's dredges are equipped with jigs either as primary gold savers or secondary to tables. As an indication of the importance of this type of equipment, Mr. Malozemoff states that since 1927, 21 bucket-line dredges have been completely equipped with Pan-American jigs. Most of the installations were made on bucket-line dredges having buckets of 6 cu. ft. capacity or larger, and a total of 480 placer-type 42 x 42-in. jigs have been furnished. Numerous dry land plants and floating washing plants have been equipped with jigs and are not included in the figures given above.

Mining men on the whole are acquainted with sluicing methods and with the use of quicksilver for amalgamating free gold. All dredge men recognize that some values are lost in tails, but to what extent depends on the conditions existing on a particular operation. It is generally accepted that the losses are greater when fine gold is present. This is also true when gold

is coated or rusty. Under these conditions jigs will usually improve recoveries. If the cost of installation and operation can be kept in line with increased recovery of values, their use should be investigated. On any existing operation a study can be made to determine additional recoveries probable through the use of jigs. Testing jigs can be installed on nearly any dredge or other plant. A sample of the continuous flow can be secured. Yardage, passing over the sampler jig, can be carefully examined and the gold content per unit of material handled calculated from the gold found in the concentrate thus made. Where gold is free, clean and not too fine, jigs are not necessary; but if testing develops that they are needed and can be used profitably, they should be installed and used. It is of great importance that exact knowledge of all factors be obtained, and "slipshod" methods of sampling must be avoided. The importance of this sampling can be compared to drilling a piece of ground for determining its potential dredging value.

Improvements in Dredge Design

In very recent years there has been a revision of thought in connection with the arrangement of tables and sluices on gold dredges. On Yuba No. 20, an 18-cu. ft. dredge owned by Yuba Consolidated Gold Fields, the table area, compared with other dredges of the same size, has been reduced by approximately one-third; fore-and-aft sluices have been practically eliminated. This has been accomplished by rearranging the athwartship sluices, permitting better distribution of fines as they are delivered from the screens to the tables. When originally designed it was thought necessary to provide Yuba No. 20 with 8,400 sq. ft. table area, but in actual operation this has been cut to 5,600 sq. ft. Water to sluices is under better control and evenly distributed to the tables. Improved recoveries are noticeable and there is a more general distribution of values, where formerly a large portion of the cleanup was made in the first two or three sluices.

Men interested in placer mining are more or less acquainted with the great increase in the number of dredges which have been built or put back into service during the past six or seven years. The increased price of gold had much to do with the revival of an industry which in 1915 was thought to have been at its peak and which in 1920 was rapidly depleting known dredging areas. Dredging companies had records of marginal properties which could not have been worked profitably at the old price, but which were quickly made available for dredging under the new price of gold. Some of these properties are much deeper than had been worked previously, and among the deep digging dredges built recently are Yuba No. 20, referred to above, and Yuba No. 17.

Yuba No. 20 displaces about 3,750 tons and was built during the fall and winter of 1938-39, nine months being required after signing contract to deliver the dredge ready for digging. Its first full operating day was May 1, 1939. Its steel hull, superstructure and gantries alone weigh 1,500 tons, and the digging units, exclusive of gravel and suspension parts, weigh 860 tons. The hull measures 250 x 80 x 11 ft., and the digging ladder is 216 ft. long. With the ladder raised out of water, the horizontal length of the dredge is about 540 ft. over all. The dredge is designed to dig 124 ft. below water level against a bank 50 ft. high if necessary. It is electrically operated, using alternating current equipment. The bucket line is driven by two 300-hp. motors located aft of the upper tumbler. These motors are mechanically synchronized and are connected by V-belts to the pulley shaft of the drive, which consists of a double train of gears.

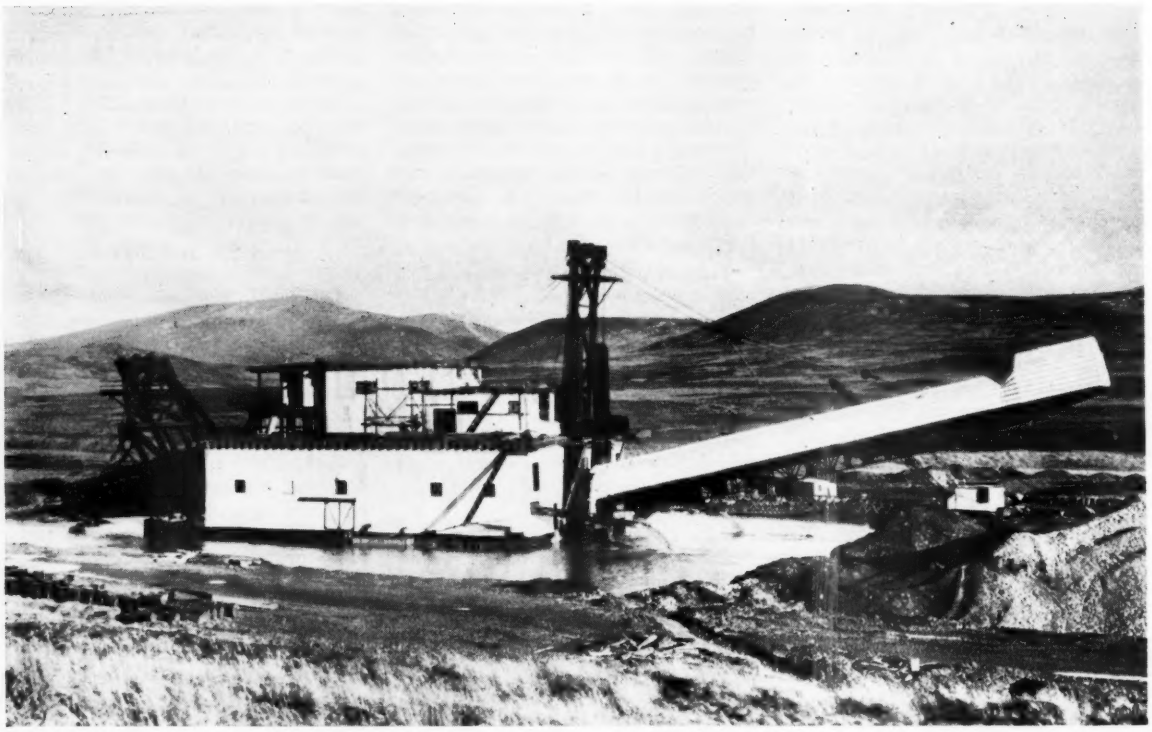
Two important features of Yuba No. 20 which are mentioned because of their importance to the placer dredging industry, particularly to those who are concerned with deep digging dredges, are the Perry patented bucket idler and the Yuba mud pumping system. The Perry idler is mounted on the underside of the digging ladder about midway and controls the catenary of the bucket line in its return to the lower tumbler. The support given to the line in this manner has resulted in decreased wear on the bucket pins, bushings, and heel plates. Supported in the middle, the line is free from excessive slapping and the resultant wear and vibration.

Pond Silt and Stackers

One of the problems which threatens the success of deep dredging is the accumulation of fine silt, which settles or slides into deep dredging ponds from tailings or from the bank. This fine material becomes 30 ft. or more deep in Yuba No. 20's pond and, without the Yuba mud pumping system, would seriously hinder the swinging necessary to dredging operations. This system includes an 8-in. Byron-Jackson pump, especially built, mounted on deck. The suction is located behind the lower tumbler and the fine mud is removed from the bottom through a pipe line carried by the digging ladder. It is discharged in two ways, either through a floating pipe line to basins some distance from the dredge or to a pipe line carried by the stacker. From the stacker line the operator can pump this fine mud onto the rock-tailings pile far beyond the face, where the mud settles into the rocks and is kept out of the pond. By pumping the top 20 ft. of the settled mud the dredge is able to swing freely and dig at the required depth. No values are found in the pumped material as any gold settles to the bottom and is picked up by the buckets.

An interesting feature of Yuba No. 20, and made necessary because of the great length of the hull, is the aux-

Caterpillar Diesel with bulldozer, Camanche, California



8 cu. ft. Yuba dredge mining platinum, Goodnews Bay, Alaska

iliary stacker used to convey rock tailings from the screen to the main tacker. This auxiliary stacker can be moved sideways and, by so doing, rock tailings can be discharged at the stern to aid in making anchorage for the spuds. Two sand conveyors are provided from sand sumps to the stacker, permitting part of the sand tailings to be discharged with rock tailings. Experienced operators are favorably impressed with the use of short auxiliary stackers, especially the side swinging feature. This type of auxiliary stacking equipment can only be used on extra long dredge hulls.

This is only a brief description of an important development in deep dredging to illustrate the need for some such equipment. It is interesting to note that another California dredge, designed to dig about 75 ft. below water level, was found to be digging over and over the fine material which had settled into its pond and which was not being removed properly by pumping equipment originally installed. This dredge was working under very severe conditions, including a high bank, and a large percentage of fine material slid into the pond. After many months of disheartening effort, changes were made in the design of the dredge and the Yuba mud pumping system installed along with the other new parts. Now, with the mud being removed from the bottom, in a manner similar to Yuba No. 20, the operation of this particular dredge has improved to a point where operations show a profit. Part of the success is due to stripping operations that permit the dredge to work in areas which otherwise might have been too costly.

Deep dredging can be carried on successfully and profitably, but only after a thorough study of all conditions has been made. One condition which has been encountered at Hammonton, Calif., on Yuba Consolidated Gold Fields' property, is tightly packed, highly abrasive gravel starting at a depth of about 90 ft. below water level. This condition, and also because the dredge-master must use greater caution when approaching corners, has reduced daily yardage somewhat. There is also a decrease in the digging time, caused by time required for raising and lowering the long digging ladder. Yuba No. 20 handles about 10,000 cu. yds. daily while using 18 cu. ft. buckets identical in size and bucket-line speed with dredges in the same field that handle 14,000 cu. yds. or more daily from depths of about 80 ft. It has been found desirable to maintain bucket speeds, on these deep digging dredges, at about 20 per minute, thereby reducing costs of replacements; the operators having in mind at all times that they are doing a mining job and not just one of excavating. Some dredges are reworking old tailings for a second time, and at Hammonton some of the tailings are being worked the third time.

Alaskan Practice

Two placer mining operations in the far north must be mentioned because of new methods developed to provide thawing and stripping ahead of dredging. In the Dawson-Yukon Territory area the Yukon Consolidated Gold Corporation, Ltd., has developed methods of thawing and stripping which materially reduce cost of dredging operations. Space does not permit a detailed account, but those interested are referred to Mr. W. H. S. McFarland's paper entitled "Operations of the Yukon Consolidated Gold Corporation," published in the Canadian *Mining and Metallurgical Bulletin* of November, 1939. Mr. McFarland is general manager of the company and he points out that stripping 15 ft. of muck before dredging nearly triples the working profit.

The other operation of interest is that of the United States Smelting, Refining and Mining Company near Fairbanks, Alaska. Again space greatly

limits description, but we wish to acknowledge the kindness of Mr. N. W. Rice, president of that company, for permission to include the information immediately following. The company's equipment includes eight dredges of various sizes, a power plant developing 11,000 kw., one Bucyrus 10-W dragline excavator, over 100 miles of ditches, about 150 hydraulic giants for stripping and about 200 miles of pipe, including 24 miles between 9 in. and 36 in. in diameter. After prospecting the general operating procedure is: (1) overlying muck from 10 ft. to 160 ft. in depth is washed away by streams of water applied through hydraulic giants; (2) frozen gravels and any remaining muck are thawed by water, at natural temperatures, applied near the bottom of the gravels through pipes driven through them at regular intervals, generally on 16 ft. to 32 ft. centers; (3) thawed gravels are dredged.

The Cripple Creek operations near Fairbanks constitute one of the most unique placer mining operations in the world today. Engineers of the company have utilized all types of excavating, earth-moving and dredging equipment to accomplish their work. In addition, they have designed special equipment for their needs and devised operating methods which are working out most satisfactorily. On the Cripple Creek operations, muck is first removed by hydraulic stripping to a depth varying from 100 ft. to 150 ft. The large Bucyrus drag line is used to excavate barren gravels 12 ft. to 54 ft. deep. The drag line excavates about 8,000 cu. yds. daily. A traveling feeder, mounted on four double crawler treads, moves with the drag line and, after receiving the material from the drag line, feeds it to the conveyor system. The maximum length of the belt conveyor is 6,839 ft. and it is built in sections to permit extending the dump as necessary and spreading tailings over a large area. About 57,000,000 cu. yds. of arctic overburden will be removed preliminary to dredging 16,000,000 cu. yds. of pay dirt. High banks are left in frozen condition where required to avoid caving.

The dredge for this property is a 10 cu. ft. Yuba built to specifications prepared by the operating company's engineering staff. Adapting some methods from the tin dredging industry, this dredge, in addition to screening gravel, is equipped with three log washers to break up clay. Gold recovery will be made primarily in 18 Pan-American placer jigs. Equipment includes a short auxiliary stacker which permits a five-way discharge. Digging depth is designed for 55 ft. below water level, with ladder at 45 degrees to horizontal. Total depth of the property is nearly 300 feet and this great depth presented a problem in placer mining which could only be solved by the use of modern equipment adapted to special needs.

Conclusion

There are today in Western United States, Alaska and the Yukon territory about 125 bucket-line dredges, some having been first built about 35 years ago. Operating costs range from approximately 3 cents per cubic yard upward, depending on gravel conditions, bucket size and yardage. It is a primary requirement of all successful dredging to operate as nearly continuously as possible. Many dredges average better than 22½ hours per day. Drag line operators apparently have not been able to approach this operating time and this may be the reason why operating costs are generally much higher than those of standard bucket-line equipment of equal capacity. Several dredges have been constructed with direct-current electrical installations, and one company in particular, Natomas, has had good results with dredges of this type. The variable speed bucket line permits an operator to speed up in easy digging and automatically to slow up when the going is hard. While this is considered an advantage by some dredgemen, others feel that a bucket-line, driven by AC motors at a standard speed, accomplishes comparable results and yardage without the initial expense and maintenance costs that DC equipment involves. At least two AC operated bucket lines in California have been slowed down materially by experienced operators for the purpose of doing a better excavating and mining job. Variable speed lines, operated at high speeds especially, are costly to maintain. Bucket lines with AC drives can be operated at slower speeds, if desired, by simply installing several points of control on equipment. Here personal opinion governs and, as variable speeds represent an important development in placer mining, they are mentioned here.

Along with the new developments in bucket line dredge design, sizes of various units have been increased, making greater yardage possible, with the idea of lowering operating costs. While labor costs have increased, the costs of many items of material are lower at the present time than they were 10 to 20 years ago, resulting in better dredging equipment at lower prices. New alloys and new uses for older alloys have increased the strength of many dredge parts and lengthened their life. It is apparent that dredge designers will be called upon in the future for stronger and more powerful dredges, handling greater volumes of gravel and at lower costs than today. Dredge design will be extended further to cover many conditions which formerly prohibited dredging. Our thoughts naturally turn in a discussion of this kind to the future. Will gold still be ample reward for the initiative and hard work of the placer miner? It is our belief that, regardless of the outcome of the present world strife, there always will be a demand and use for gold, and that the placer miner's efforts in the future will be guided by the hope for profits. He will still adapt to his use equipment of any and all kinds that will help lower cost of production and earn him a profit in supplying the constant demand for gold.

12 cu. ft. Yuba dredge equipped with oversized machinery and special equipment for extremely hard dredging, including boulders

— *Discussion* —

CHARLES WHITE MERRILL
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H. W. C. PROMMEL
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ONE source of satisfaction to me is that we have gotten this far in our placer-mining discussion without talking about "doodle bugs." This method of mining was started in California in 1933 with a gold output of less than $2,000 and produced over $6,000,000 in gold in 1939. I think that any method with so impressive a record should no longer be belittled by the slang term "doodle bug" but should be dignified by a definite and precise name. The term "drag-line dredge" qualifies and fortunately is already wisely used in the industry.

Chas. W. Merrill

I think that some of the statistics on placer mining in California gathered at my office will prove interesting in indicating trends in the industry. For example, in 1934 the average value of gold recovered per cubic yard by dragline dredging was 20.1 cents; this declined each year until 1938 when it was 16.8 cents. The trend was reversed, however in 1939 when it rose to 19.1 cents. I do not think that this means that the operators are going to make a lot more money but rather that many of them have run out of large low-grade deposits and are now making short stands on relatively high-grade gulches. Efficiency and reduced cost in moving make such operations possible. Some data I have gathered on the cost of moving from place to place indicate that moves are made for from $1,000 to $2,000, not including loss of time. In other words, only a small part of the gold recovered has to be allocated to payment for moving.

The trend in bucket-line dredging since 1930 has been a treatment of larger yardages of gravel each year and larger recoveries of gold each year until 1939, when production fell very slightly below the all-time record set in the preceding year. The average value of gold recovered per cubic yard rose from about 8 cents to about 12 cents during the period when the price of gold was increased, but by 1939 had declined to 10.7 cents.

Another important method of placer gold recovery in California is the non-floating washing plant fed by mechanical means. Some washing plants are stationary while others move on tracks, caterpillar treads, skids, and other means; gravel is delivered by dragline excavators, trucks loaded by power shovels, scrapers, bulldozers, carryalls, and other machines. In 1939, 114 outfits treated 5,512,000 yards of gravel, which yielded an average of 26.5 cents of gold per yard.

So far hydraulic operations have not reacted very favorably to the new price of gold but some encouragement is taken from the fact that Federal-financed dams are being provided to impound hydraulic tailings at reasonable rates.

The small-scale hand operators using both wet and dry methods, about which we heard so much during the depth of the depression, have declined in importance; these men, however, produced over a million dollars of gold in 1939.

WHILE Mr. Romanowitz and Mr. Sawin give due credit to the development of modern machinery in the placer mining industry and to the users of drag lines, floating stacker scows and dry land dredges, they definitely point out that the modern, huge bucket dredge is still supreme when it comes to placer mining on a large scale. On the other hand, I do not believe that they have sufficiently stressed the small scale placer mining operations which have advanced by leaps and bounds all over the world since the depression of 1929.

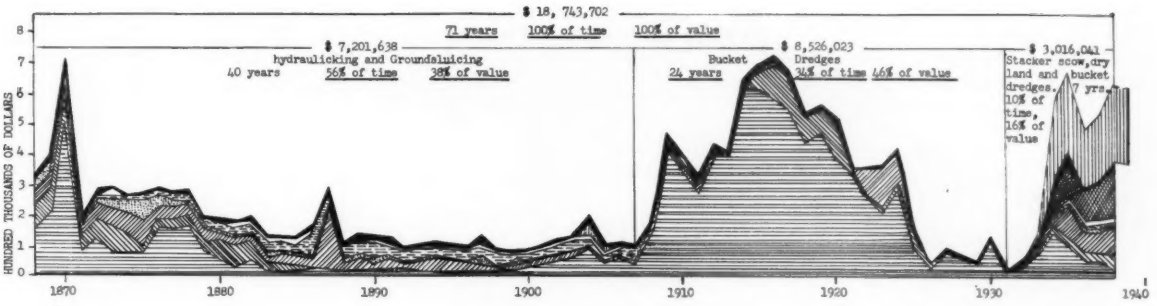
H. W. C. Prommel

I fully agree with the authors of the paper presented above that the importance of honest investigation and proper logging must not be overlooked on large properties, as well as on small properties. Newcomers in the field of small placer operations are very often sand and gravel companies, as well as road contractors, who believe that all there is to placer mining is moving dirt.

Colorado Placer Mining Study

During the spring of this year I made an extensive study of the history of placer mining in Colorado, from its inception in 1858 to the end of 1938. This study was based on eight years experience in investigating placer mining possibilities in this state and on the detailed statistical records of Dr. Chas. W. Henderson and A. J. Martin of the Denver office of the United States Bureau of Mines.

During 1939, in Colorado, a total of 27 operations with new modern equipment produced 86 percent of the total placer output for the state which was approximately $630,000. Twenty-four of these used draglines in connection with dry-land dredges, one used drag-line and floating dredge, while two bucket dredges operated part of the time, besides many small scale hand operations. During the 1932-38 period about one-third of the total production in Colorado came from only three operations of the dry-land and stacker scow dredge type on two streams, while one-fourth came from two bucket dredge operations. The three operations, two dry-land dredges and one floating stacker scow dredge, which produced one-third of the total production, owed their success to careful sampling and investigation and honest thorough planning before operations were started. I firmly believe that medium size placers can be suc-



1858-1867 Total Value of Production from Vein Outcrops and Small Scale Sluicing and Groundsluicing $14,923,918, Not Segregated.

COLORADO
PLACER GOLD PRODUCTION
1858—1938

TOTAL PRODUCTION	1858-1938	80 YEARS.	TOTAL VALUE	$33,667,620.	100% OF TIME.	100% OF VALUE.
Hydraulicking	1868-1907	40 "	Value	$ 7,201,638	50% " "	22% " "
Bucket dredges	1908-1931	24 "	"	$ 8,526,023	30% " "	25% " "
Dry land, scows	1932-1938	7 "	"	$ 3,016,041	9% " "	9% " "
Flush production	1858-1867	9 "	"	$14,923,918	11% " "	44% " "

LEGEND

- Increase in value of production due to increase in value of gold from $20.67 per oz. to $35 per oz.
- Total production from 9 to 26 counties.
- Gilpin County.
- Jefferson County.
- San Miguel County.
- Summit County.
- Moffat and Routt Counties.
- Chaffee County.
- Clear Creek County.
- Park County.
- Lake County.

The number of placer gold producing counties in Colorado is constantly increasing. While the production from the largest number of counties is as yet small, it points the way toward expansion of production on a larger scale.

1858-1867	Number of producing counties				6
1868-1907	"	"	"	"	17
1908-1931	"	"	"	"	22
1932-1938	"	"	"	"	34

During the past seven years the increase in the price of gold, modern machinery requiring less initial capital investment for large scale placer mining, and better testing equipment and methods have removed most of the restrictions to the operation of medium size as well as large size placer deposits in Colorado.

cessfully worked if newcomers realize that medium scale placer mining is not merely a dirt-moving operation but a science and a business in which the placer mining engineer has his place. This belief is borne out by the fact that one operation in Colorado during the years 1937-39 produced a gross of $268,000, in two and a half placer seasons with a small floating stacker scow from ground which had lain idle for 40 years and which had formerly been turned down by one of the largest mining companies in the United States. During the first two seasons average value of the gravel was 32.7 cents per cu. yd. There are many other prospective properties in Colorado which await careful testing, development and exploitation.

Colorado Placer Production

In connection with my studies I have prepared a graph on the total placer production of Colorado which shows at a glance the different stages which this industry passed through during 70 years. The time interval can be divided into three periods, that of hydraulic mining, that of the development of the modern bucket dredge, and that of the development of modern equipment for the operation of small and medium size placer properties. The graph shows that in Colorado we are constantly producing *more values* in placer gold in *less* time and that during the last eight-year period of placer mining we have reached the third highest peak in value of placer gold. This, during the next years promises to become the highest peak in the graph if—but only if sufficient attention is paid to careful scientific investigation, sampling and testing prior to starting operations on any property.

When thinking of placer mining our thoughts naturally turn to California and Alaska as the principal placer gold producing localities. Montana and Idaho, as well as Nevada often receive honorable mention, but to think of Colorado as a placer gold producing state is considered a folly by many. Nevertheless, I have developed these salient facts:

Of the total gold production of Colorado from 1858-1938, inclusive, which amounts to approximately $795,266,000, 95.9 percent was derived from lode gold mines, while only 4.1 percent came from placer mining.

Taking into consideration geologic and physiographic conditions in the western part of the state, a much higher production of placer gold than has thus far been obtained seems warranted.

Forty-four of a total of 63 counties in Colorado have produced gold. Thirty-four out of a total of 44 gold-producing counties have produced placer gold. Among the 44 counties there are at least 22 counties in which immediate exploration and sampling of individual placer deposits is warranted.

The total past production of placer gold in Colorado to 1938, inclusive, has amounted to $33,667,620. Seven counties produced 95 percent of all this placer gold. This has come from a very small area as compared with the area of the remaining 27 placer gold-

(*Continued on page 68*)

MARKETING AGENCIES*

● ***Research and intelligent salesmanship is prime need of coal industry to best serve consumer, operator and employe. Minimum interference from regulation will allow industry to forge ahead***

By R. E. HOWE
President
Appalachian Coals, Inc.

ACCORDING to the latest published information on the subject, coal stands second in point of value in the mineral production industries of the country, but it is of infinitely more value to the country, as a whole, on account of the bituminous coal industry alone paying three times as much wages as the runner-up in the mineral industries. In Illinois, coal employs twice as many men as your great meat-packing industry. It also stands at the head of the list in economic importance, whether it be for peacetime activities or for National Defense.

Millions of years before the advent of man, Nature was preparing for his coming and for his comfort; when giant ferns and other vegetation were blown down, covered by sand and dirt; and with heavy pressure during hundreds of centuries, this vegetation became coal.

It was comparatively recently, however, that man learned to use this wonderful material—and even today we have a very superficial knowledge of its many and varied uses.

Factors Affecting Coal Sales

By far, the greater part of coal is now *burned* in one way or another and in normal times our mines can produce much more coal than the country can consume. That is why coal has been sold at prices which have not brought anything like an adequate return; one reason for this was that until within the last few years coal was bought and sold without regard to its value for the purposes to which it was to be applied. Many men, both buyers and sellers, considered coal as a black substance dug from the ground and if thrown on a fire would make heat. There was little being done to sell it intelligently and even less being done toward getting the ultimate value out of it.

Now, coal is not bought or sold in that way. Our modern coal tipples are no longer just a shed built on poles so that coal could be dumped from mine cars into railroad cars. A modern coal tipple is really a large and efficient manufacturing plant. Such plants clean, size and otherwise prepare their product to give their customers the fuel best suited to the consumers' needs. In our company alone, we have over 125 different sizes; this is entirely too many sizes perhaps and should be materially reduced, but I mention it here to show the extent to which the producers have gone to give their customers what they want.

The Sales Agency Plan

It was late in the year 1931 that forward-thinking coal producers of the country concluded to do something about the lack of intelligent salesmanship . . . several meetings were held, from which the regional sales agency plan was conceived. However, it remained for the producers of the southern high volatile fields, consisting of West Virginia, Kentucky, Virginia and Tennessee, to really do something about it. After many meetings and herculean work, Appalachian Coals, Incorporated, was born.

The primary purposes of this agency was and is to sell more coal intelligently and efficiently, and at a price, if possible, which would yield the producer a reasonable profit after paying his employees a living wage, and at the same time give the consumer the

* Address at the dedication of the Natural Resources Building, of the University of Illinois, during the Mineral Industries Conference, November 14, 1940.

greatest value for his investment in fuel.

The new corporation had not gotten under way, however, before the Department of Justice brought an injunction on the grounds that it was a monopoly . . . a combination in restraint of trade and in violation of the Sherman Anti-Trust Law. It took about a year to defend this suit and on March 13, 1933, the Supreme Court of the United States found in favor of Appalachian Coals, Incorporated.

The corporation immediately set up offices in Cincinnati and started building its staff. On April 17, 1933, it formally opened its offices and started to work.

Not a Trade Association

Let me say right here that Appalachian Coals, Incorporated, is a corporation organized, among other things, to mine coal, to buy and/or sell coal, to buy or sell coal lands, to purchase, own, sell and develop, lease, work and operate coal mines, coal lands, etc. It is owned by the producers whose coal it sells; the stock ownership is based on the annual tonnage of these producers. The stockholders elect the Board of Directors, who in turn elect the officers, the same as any other corporation; it is not a trade association.

Developed Information Necessary to Give Best Service

In order to carry out our original intention, we needed to do many things; we needed to know all that could be known about the movement of coal; plants in which our coal would give the highest efficiency; statistics on all subjects which had to do with the production, transportation and utilization of coal.

We now have departments covering statistics, market promotion and fuel engineering. We furnish our producers and sales outlets with every conceivable bit of information which is useful; and we keep records of the many industrial plants in our consuming area (28 states) . . . the kind, quality and amount of coal they use.

We also give fuel engineering service to our customers to enable them to obtain the highest efficiency out of our fuel. We have held 26 fuel engineering conferences in various parts of the country. At these meetings are the fuel engineers of our affiliated companies, engineers and plant managers of our customers and many other individuals who are interested in the subject of efficient fuel utilization.

We are in constant contact with coal distributors and retailers, both individually and collectively. We have published a hundred or more different pamphlets to home owners, coal retailers, stoker users and industrial plants, several millions of copies of which have been distributed.

All this has been done to accomplish our original intention of selling more coal more intelligently and giving the consumer full value for his dollar.

Not a Price-Fixing Body

There has been an erroneous impression almost since the beginning of marketing agencies that this organization was and is a price-fixing body, when it has no wish and certainly not the power to fix prices. It is a coal-selling organization and a fact-finding body. After we have ascertained all of the facts, we must reach some conclusions as to the prices actually existing in the markets for the various sizes of coal and then, in order to carry out our contract to sell the coals of our affiliated producers, we determine that the prices so found are the prices at which we must sell the various coals. This was true before the effective date of the Bituminous Coal Act and is still true except that we cannot sell below the minimums fixed by the Coal Division.

Coal Industry Needs Balanced Research Program

As a great industry which supplies 52 percent of the nation's energy, we, the industry, have woefully neglected one vital thing—research. It is true there have been sporadic attempts to do some research by individual companies, and Bituminous Coal Research, Inc., the industry's own organization, did most outstanding work on small stokers, stoker coals and hydrogenation during the first three years of its existence and now it is ready to launch a second program, which will yield further important results. However, on the whole, the coal industry has not been realistic in its attitude toward research. As in other major industries, a well balanced research program could have done much to improve the financial condition of our industry. We are inclined to say that in our present state we have no money for research. We evidently have not yet learned that whether we think we can afford research or not, the fact remains that we cannot afford *not to do it.*

Appalachian Coals, Incorporated, was the first marketing agency formed and, except for a few setbacks occasioned by various pieces of legislation, has been continuously and energetically carrying out its original purposes. Since the formation of Appalachian Coals, Inc., there have been 13 other marketing agencies formed—3 of these in your State of Illinois.

There is no doubt that these marketing agencies have been of tremendous value to the coal industry and I believe other natural resource industries could improve their situation by adopting some such plan. Some little activity has already been made in this direction; Appalachian Apples, Incorporated, and I believe there is one in the brick and clay industry.

Too Early to State Effects of Guffey Act

No doubt some of you have wondered what effect the Bituminous Coal Act of 1937, otherwise known as the Guffey Bill, is going to have on our industry. This bill had been a law for about three and one-half years when the first effective price list was published and that was October 1, 1940. It is too early to say just what effects it will have. In our company alone, we have over 40,000 prices and the rules and regulations are complicated. We have over 100 marketing areas in which we sell coal, which makes it very difficult to follow sales details. We do not feel competent at this time to pass judgment on the result of this legislation. As to marketing agencies, the Coal Bill provides for cost only and if the producers expect to get any profit, they will have to do it through some cooperative arrangement, such as marketing agencies.

Coal and National Defense

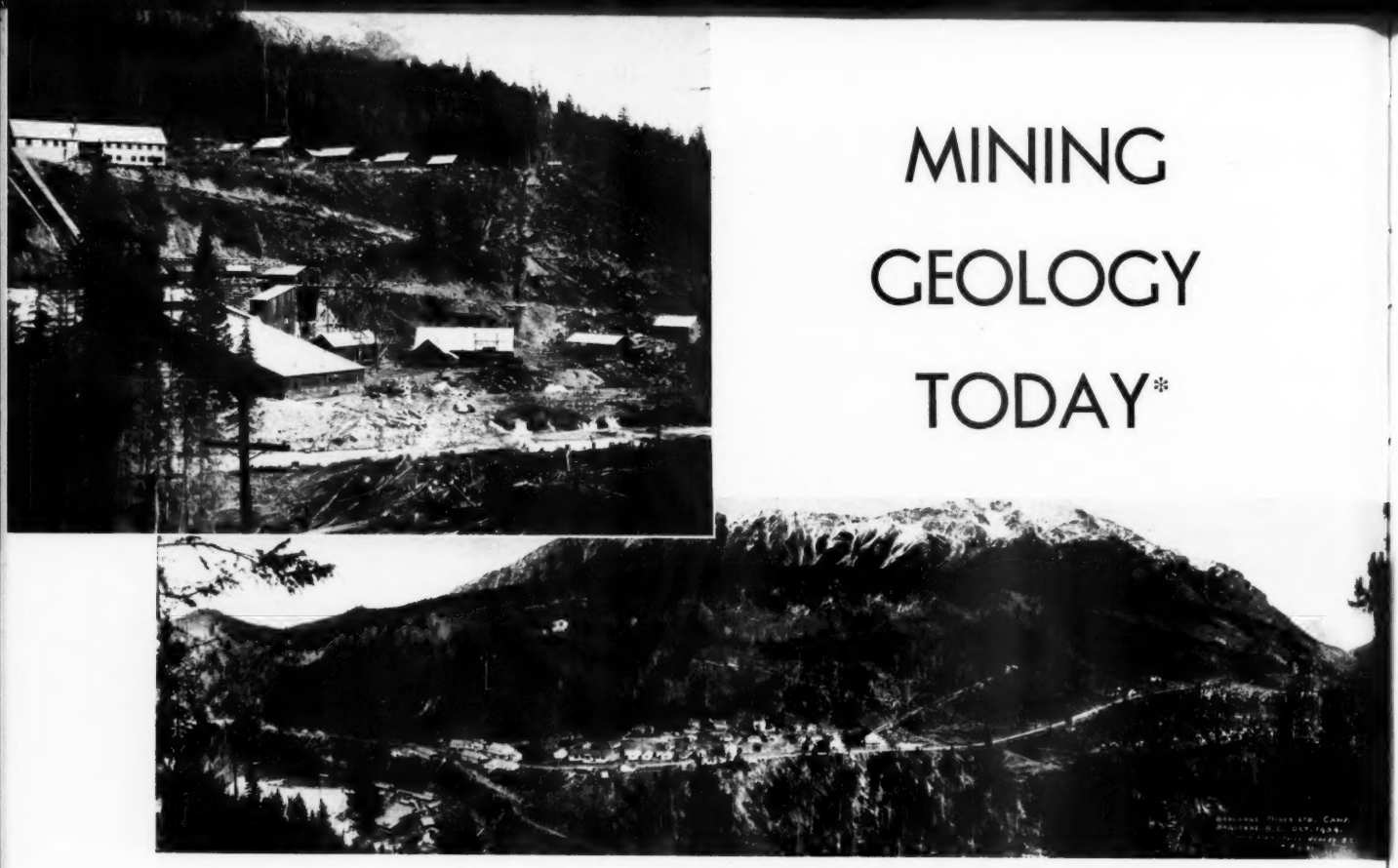
Now that the election is over, national defense is paramount in our minds. What about coal in national defense? It is of first importance to almost all national defense industries, to railroad transportation and is a basic material for many chemicals and explosives.

There is an ample coal supply at present, but with winter coming on . . . industrial expansion growing with ever-increasing acceleration . . . more load being put on the railroads as this expansion gets under way, and losing a certain percent of our men under the draft, it is impossible to say that this coal supply will continue to be ample if customary placement is retained.

The coal industry will do its part, but in order to do so it must be given a chance with a minimum of inter-

(*Continued on page 50*)

MINING GEOLOGY TODAY*



Above—Bralorne mines and Townsite, Bralorne, B. C., 1933. Below—Same in 1939, showing present day development of this important gold producer

"MINING Geology Today" covers so great a field that it seems hopeless to even scratch the edges of the subject in this presentation. Really there are several different sorts of mining geology, each suited to a different type of problem. And for each sort of geology there is a group of geologists who specialize more or less on the problems to which that kind of investigation applies. A few unusual men are equally good at all the methods of using geology to aid mining, and realize that all of the different lines of attack have their place. More often geologists become so interested in one kind of work that they become a little intolerant of the others. If one of these narrower gauge geologists happens to be selected for the wrong problem, he is likely either to fail to solve the problem or to solve it at unnecessary expense to his employer. This hurts both us and those who hire us. It may therefore be worth while to call attention to the different ways in which geology may be used, and to their limitations.

* Presented Annual Metal Mining Convention, Western Division, The American Mining Congress, Colorado Springs, Colo., September 16-19, 1940.

Geology's Aim to Find Ore at Reasonable Cost

The aim of mining geology is to find ore at a cost that is not excessive compared with the value of the ore found. Evidently the problems are far different in a great district where orebodies may be worth millions of dollars, and in a region of small mines where every penny must be pinched to allow successful operation. The geologist who has the interests of his employer at heart must govern his work accordingly. In an examination of a new mine the problem is still different. Here it is uncertain whether or not any profit will result from the study. The geologist must therefore be still more careful how he spends his time and his client's money. These are the three main types of problems—the search for great ore bodies, the search for small ones, and the examination of new mines or prospects. Each of the three demands its own geological method.

By IRA B. JORALEMON
President
Desert Silver, Inc.

There is of course much overlapping in mines of moderate size and in cases where examination is supplemented by more or less development. However, the types of problems are sufficiently distinct to be worth separate consideration.

The Search for Ore in the Great Mining Districts

Those who hunt for ore in the great districts are in many ways at the head of the profession. In such work, the

value of geologists is universally recognized, and needs no defense. In addition to the geological staffs of the great companies, this group includes the State and Federal Geological Surveys, as the whole country may be considered a mining district with almost unlimited possibilities. The Survey geologists, and those who work for Anaconda, Homestake, and the other progressive companies, are like the research scholars in other branches of science. They must be highly trained, meticulously thorough investigators. They record every fact, microscopic or otherwise, about known ore bodies and their setting. No detail in the private lives of the deposits is too minute, or too intimate to be noted, and the ones who specialize in them may almost be called the Winchells—Walter and not Horace—of the profession. Much of the study will obviously be up a blind alley, with no practical outcome. But the Surveys and the geologists who work for large companies have learned to realize—to use President Conant's phrase—the revolutionary nature of useless knowledge.

They can therefore work with no need for immediate practical results. Accurate detailed mapping of structure, underground and on the surface, will involve recording many phenomena that have nothing to do with ore deposition. But now and then the maps may allow the discovery of unsuspected fault blocks of fantastic value, as has happened so often in Butte. Months spent in painstaking investigation of slight differences in bedding may seem a waste of time. But now and then it will throw a new light on the nature of ore bodies, and, as at Homestake, make it possible to double the grade of ore mined at an insignificant expense. Microscopic study of alteration in hundreds of specimens of wall rocks may prove the cause of the localization of orebodies, and save many thousand feet of useless development. The most insignificant detail of today may lead to an entirely new outlook in a great district tomorrow.

The success of this scholarly research in many of the larger mines has convinced the management, as well as the geological staffs, of its value. Therefore, those in charge of most of the larger companies have given their geological departments a free hand. The executives often have no idea what the work means, and they look with a little horror at the mounting expense for what seems suspiciously like pure science. But years of success in finding ore by careful geological research have converted the most skeptical. In most of the larger companies, development work is planned almost exclusively, by the geological departments.

Universities Providing Thorough Courses

More thorough training in the better universities has added to the high standing of the geologists who use the technique of scientific research at the expense of other groups in the profession. More and more able and ambitious young men are doing graduate work, often leading to a doctor's degree. They learn the satisfaction of mastering even a limited field in the profession. Many of them acquire a respect for real scholarship that makes them unwilling, or even psychologically incapable of doing work that they consider sloppy and fragmentary. This attitude often makes them intolerant of those who do not employ the same thorough technique, regardless of circumstances.

The geological investigation tends to become the end, and not the means.

In work for the Surveys or for great companies, this scholarly viewpoint has many advantages. As in all scientific research, real success comes only to a few. The company or the government can afford to employ a dozen geologists if one of them now and then makes a great discovery. And if the geologists themselves have learned to value the work itself more highly than results in dollars and cents, those who spend their lives up blind alleys can be happy and self-respecting even if they do not happen to be the ones who find the ore bodies.

Problem of the Small Mining Company

Unfortunately, most mining companies cannot afford thorough geological research, however much they realize its value. The majority of mines are comparatively small, and their margin of profit is low. If they hire geologists who spend many months in a detailed survey of the mine and the district, the ore found is likely not to pay for the cost of the finding.

Too often such companies say that geology is not for them. A little reading of involved geological articles or perhaps experience with a young geologist who spends months in study of rock alteration when the vein has been lost at a fault, makes them unwilling to pay for further technical advice. So they trust to the guidance of an overworked engineer or mine foreman in planning development. They have not learned that there are geologists who will suit their methods to the possible return, and remove at least some of the uncertainties of exploration based on hunches or blind cutting up of the ground.

Limited Geological Studies Often Pay Large Dividends

The geologist who works on these less remunerative problems must be acutely conscious of the financial limitations. There may be lines of study that are exciting and tempting from a theoretical point of view. If they do not promise a quick and adequate return to the mine owner, they must be regretfully abandoned. There is only time and money for the sort of geology that promises immediate results.

It is remarkable how often such limited geological study will pay big dividends. Nine times out of 10 the discovery of additional ore in a mine—and particularly a small vein mine—depends on the solution of fairly simple structural problems. The vein may have been displaced by a cross fault, and a few hours study of the same fault in other workings or on the surface, or a careful inspection of drag material in the fault, may show the direction and amount of offset. Often strike faulting, or faulting that makes an acute angle with the vein, may end the ore without any change in structure that is apparent to casual or untrained observation. In some Mother Lode mines in California, for instance, thousands of feet of drifts have been run on the gouge of slicing faults, encouraged by small drag blocks of ore, and the places where the undisturbed veins leave the faults have been entirely overlooked. The association of veins with later strike faults is so common that in many districts a heavy gouge is considered an essential accompaniment of ore when the association is really accidental and occasional. Most of such fault problems in small mines can be solved by a fairly well trained geologist by occasional visits, or in intervals between engineering or other jobs at the same mine.

Special Conditions May Be Beyond Small Mine Resources

Where the localization of orebodies is due to a special type of wall rock, the problem may be beyond the re-

sources of a small mine. The detailed mapping supplemented by microscopic examination may cost more than orebodies are worth even if they are found. Usually a fairly brief inspection will find the cause of the difficulty even here. It is seldom that a change in rock great enough to influence ore deposition is not evident at a glance. It does not require long microscopic study to tell limestone from quartzite or greenstone from slate, and a few hours of observation plus imagination will usually be sufficient to guide exploration, at least for a few weeks. Many recurring short visits at reasonably close intervals, backed by inexpensive development between visits, are usually more effective and much cheaper than long and detailed study.

Another most useful, but often sad service the geologist can render to the small mine at a reasonable cost is to say when to quit. A day's statistical work, following a quick examination, often proves that orebodies are too small and too widely scattered to be worth further development. If there is no evident way to cut the cost of exploration, further work would be futile.

In making decisions based on the examinations of a day or two that are all the smaller companies can afford, the geologist runs a risk of missing some hidden factor that might profoundly influence his conclusions. Occasional orebodies may escape him, or he may spend too much money to find the ore. He may even cause the mine to shut down when a more detailed study might find profitable ore. This is a risk that he and his clients must run. If he has had a fair amount of experience, added to the intuition that no amount of detailed drudgery can entirely replace, the chance of making such mistakes is slight.

Geology a Help to Small as Well as Large Mines

In all but an insignificant proportion of cases, geology will help the small mine as much as it will the big one, and the expense can be held to a figure in keeping with the results. One or two hundred dollars a month spent for part time work of a young geologist who can do other useful work the rest of the time, or for occasional visits by a consulting geologist, are often sufficient. The mines that follow this practice almost always benefit by many times the cost of the work. The geologists who carry on this sort of practice miss some of the satisfaction that comes from the consciousness of doing thorough, scholarly research. To make up for this, they gain by a more varied experience, and they are more certain to have the fun of finding ore. They may be a step lower in the ranks of the profession, but they need not be ashamed of the service they render to mining.

Geology as an Aid to Mine Examination

In descending to those who use geology as an aid to mine examination, we sink still lower in the scale of respectability from the point of view of true scholars. This last branch of the profession may be called an illegitimate child that came unwanted into this world before the true union of scientific geology with mining began. It may even be suspected that the lowly "field man"—the superannuated smelter man or the shift boss with a touch of miners' consumption who used to scout for so many of the mining companies and who blundered on to many of the great mines—had some clandestine influence on the birth of the examining geologist. At least the geologist who tries to find new mines, must compete with centuries of success by untrained prospectors and mining scouts, and he must adopt some of their methods if he is to replace them and better their record.

Exploration Is an Uncertain Venture

At the bottom of the search for new mines lies the inescapable fact that exploration is a harrowing and uncertain venture. At the very best, an exceedingly small percentage of the properties, examined, or even developed, can be successful. Just what the ratio of success may be depends on individual luck as well as on skill and perseverance. It varies from the published record of a great Canadian exploration company that examined 2,000 prospects and did not find one worth spending a nickel on, to the intoxicating stroke of fortune of the occasional amateur who stumbles on a rich mine on his first try. There are no adequate statistics for the industry as a whole. To give some idea of the degree of risk, it may be worth while to record the results of more or less personal knowledge of 1,500 or so examinations. Here is the story:

One in three properties considered is worth a casual examination.

One in ten properties examined is worth at least a little development—often only to the extent of a few hundred or thousand dollars.

One in six or eight properties developed—or one in 60 or 80 examined—can be made to yield a profit above the cost of development and equipment. In most cases the profit is small.

One in four of the profitable mines—or one in 250 to 300 of those examined—will turn out to be a great success, that will return more than a million dollars a year.

This record is probably not fair, as there was much sorting out of more hopeless prospects before the series started. It at least shows that exploration is a pretty hazardous business.

Unless the geologist who enters the field of mine examination thoroughly appreciates the hazards, he is doomed to disappointment. He may do the most careful and accurate work, and come to the right conclusion every time, and still never find a mine. The first hundred prospects he examines may be worthless. If he takes weeks for every examination he will never get a chance to see any more. In his own eyes and in those of his employers he is a complete failure.

Laws of Chance are Necessary Allies to Geologists

The only way to ensure success is to make the laws of chance allies instead of ruthless adversaries. The geologist who wants to find new mines must carry on a constant race against time in order to see enough properties so that there will surely be good mines among those he examines. And with all his haste, he must avoid any risk of committing the unforgivable sin of turning down a big one.

Cites Economic Aspects

The problem becomes one of rapid and efficient elimination. Haste becomes a virtue instead of an evidence of careless and sloppy work. Both the examining geologist and the company that employs him must complete many examinations in a short time if they are to be sure of success. The old prospector knew this, and wore the legs off his burro hurrying after each new rumor of Eldorado. The field man of 20 to 40 years ago knew it just as well, as the competition for new mines was then intense and he had to be among the first in every field. The geologist of today must learn from them the art of quick and

New Cornelia Branch, Phelps Dodge Corporation, Ajo, Ariz. Above—1915 when development was just getting under way. Below—1937, showing extensive open-pit operations

accurate judgment, nosing out the weak points of every new mine like a detective, and dropping the investigation the moment that any unfavorable clue proves that the property is not suitable for his client.

In most cases the decision must be adverse before geology even starts. The price asked may be excessive even if the ore bodies are better than can be hoped for. Or the cost of transportation facilities may be too great for the size of the mine. Metallurgical difficulties often are too tough for a client with a moderate bank roll to hope to solve, and even if a fair product can be made, complications in marketing may make it inadvisable to start a new venture. A little elementary engineering, such as measurement of development necessary to make a ton of ore available, may prove in a few minutes that there is no chance of success. If any of these more obvious facts kill the property, there is no justification for geological work no matter how fascinating the theoretical problems may be.

Even if the simple economic aspects are not fatal, there is seldom need for anything save very hasty and casual geological mapping in the course of examinations. In many places an airplane reconnaissance or a geophysical traverse can eliminate large areas much more quickly and accurately than a detailed local study. The quickest and cheapest correct solution is always the right one even if it does make a research scholar throw up his hands in horror.

Where the preliminary view shows that geology will play an important part in an examination, detailed work must still be looked on with suspicion. In nearly all new mines exposures are inadequate to allow a reliable conclusion as to which features in ore association are essential and which are accidental. Soil or talus may cover all save an exposure that is not representative, or a crosscut may have stopped too soon to show a structure that controls ore deposition. If enough development has been done to prove the cause of localization of ore, the chances are that the property is held at a price that discounts all the profits that can be hoped for. Too detailed a study of phenomena that will probably prove not to be related to ore deposition will not only waste time, but often will give a wrong idea as to the occurrence.

Effective Work Done Through General Surveys

The examining geologist can usually work more effectively by making a general survey rather than a detailed one. He tries to get a bird's-eye view of all the geological features, and interprets them by judgment based on familiarity with many mines and districts. Every new observation suggests a theory born of resemblance to another deposit, and the next observation usually kills the theory. The imagination is constantly putting itself in the place of the ore-forming solutions, and telling itself stories about what it would have done if it had been travelling through the ore channels. The stories are never complete, as many of the paths are hidden, and analogies are dangerous because no two orebodies are alike. If the mind is not blank—as it often is in the early part of the examination—some one theory is in the ascendant at every moment. But the geologist must not devote himself to any one theory or to the facts that support it long enough to fall hopelessly in love with it. He must make each theory the object of a summer's flirtation and not a wife—

and he must be ready to throw each one over the moment a more attractive mental maiden comes along.

Geology Governing Mine Examination More Hunch Than Science

The geology that governs mine examination seems so fickle that it is more hunch than science. But much of the subconscious judgment is based on general conclusions from experience that are seldom far wrong. Orebodies in every district have a habit that the trained observer soon recognizes. They are large or small, shallow or deep, scattered so that they are expensive to find or following a definite plan that can be fairly well solved. Rich oxidized ore of copper and silver and often gold must be looked on with suspicion, as it often gives place in depth to leaner sulphide. Cracks that have no great horizontal extent cannot be trusted, while throughgoing fissures in igneous rocks are likely to persist to great depth. Any probable change in wall rock in depth, and particularly a change to a less competent rock, is dangerous. A great development of contact metamorphic silicate near a limestone-porphyry contact is likely to seal the openings with dense, resistant rock so that orebodies are small. Many such generalizations are half conscious, and exception to them are always possible, but they help the geologist to form quick conclusions that are usually right.

Important to Have Free Mind and Plenty of Imagination

The all-important thing is to have no convictions or fixed ideas, and lots of imagination and hope. If the imagination suggests that there is a chance of finding valuable ore, and if the chance can be checked at an expense in keeping with the possible prize, some further step may be worth while. This may take the form of a detailed geological study. If a shaft or drift or drillhole will give the same information as cheaply as the thorough geological survey, the actual development is better. The cheapest and most certain way to prove or disprove a theory is always the best one. Geology is only one of many tools the geologist must have at hand, and it is often not the right one to use. He must keep it in its proper place even if he violates all his ideals of thorough and scholarly work in so doing.

Above all, the examining geologist must keep in mind the inexorable laws of chance. At all cost, he must eliminate the worthless properties quickly, or he will never see enough of them to find a good one for himself or his employer.

True scientific research is the crowning achievement of the Survey or large-company geologist. It is an expensive luxury for the geologist who serves small mines, and often a paralyzing sin for examining geologists. Yet all three types of geology, widely as they differ, are equally necessary. They should be equally respectable. If they are mutually understanding and tolerant, every type can help the others, and geology will win an increasingly high position in the mining industry.

— *Discussion* —

EDWARD THORNTON
General Manager
Summitville Consolidated Mines, Inc.

DR. FRANCIS A. THOMSON
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GEORGE M. FOWLER
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Joplin, Mo.

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MY discussion of this subject is from the viewpoint of the operator. In the final analysis the operators are the men who carry out the geology and it is their understanding of the problem and close cooperation with the geological staff, or consulting geologist, as the case may be, that means a very great deal in the practical application of ore finding geology.

Edward Thornton

I do not believe that I can overemphasize the importance of carefully considered geology. I have changed several large properties from wide red figures to comfortable black margins by either a detailed knowledge of that particular problem, or with the assistance of able and experienced consulting geologists who worked out the ore deposition.

The small mine is usually running on a very close margin between its daily tonnage and mill capacity, so it is a struggle to keep up the tonnage and grade. Thoroughly mapped geology and carefully planned development will not only materially cut development costs but can well disclose unsuspected ore bodies. I can say from experience that if the type of the deposition is thoroughly studied the geology mapped in detail and the pattern of the deposition worked out—then it is almost axiomatic that well planned development will at least pay for itself and, of course, a certain amount will open up real ore bodies, depending on the type of deposition.

I have rather wondered if the small mine, from the standpoint of economy, has not neglected the importance of real ore finding geology with the help of experienced consulting geologists. It is quite easy to be complacent, particularly if you have a fairly strong vein and a fair ore body. I know of a particular property that produced 16 to 20 million dollars in the early days. Recently there was a question of reopening the property. A competent geologist was employed to make the preliminary investigation. He found that while the vein had apparently pinched out it was actually set over in eschelon, so he di-

rected some surface trenching. This work disclosed an extension of the vein with ore running from one to three ounces. While 16 to 20 million dollars were mined, I am wondering how much was missed.

On the other hand, it is quite easy for the geologist to be complacent and not properly evaluate the data actually disclosed, nor read clearly the sequence of the opposition. This emphasizes the value of experience in mapping and examining in detail a great number of mines. The geologist is in a position to evaluate not only from science and theory, but by actual experience.

While many of these points might be elaborated in detail and many examples cited, I will confine the discussion to the geology applied to the mining, and not touch on exploration work. It is my feeling that to get the best from applied geology means close cooperation between the management and the geological department, or the consulting geologist. I mean by this you can balance geological and mining problems and probably cut costs both ways.

Even with a small mine mapping in detail and a proper study and evaluation of the disclosed data by thoroughly trained geologists is very much cheaper than ill-considered development. If this is done, I can say definitely from experience that it means increased profits and increased life of the property.

THE Dutchman said, "The longer we live the more we find by golly cut." The same reasoning applies to geology; it is a progressive study.

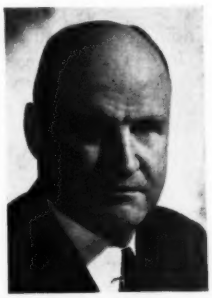
To be successful a mining geologist should be a keen observer and analyst. This goal is approached through ability, experience, and knowledge. Many of us fail to see or recognize the almost evident essential factors that control ore localizations. We see only the things and conditions that are familiar to us. We are governed too much by past experiences and past observations.

It has been suggested that the mining group as a whole should critically examine, appraise, and record their present knowledge of ore deposits. What is really known regarding this very important subject? Are too many opinions based on theories instead of factual evidence? A symposium on the present knowledge regarding ore deposits would be of interest and benefit to everybody engaged in ore search.

In the early search for ore deposits in this country the investigators studied very large regions. Little was known regarding the mineral deposits there or the reasons for the localizations. Now, thanks to the efforts of many capable workers, such as members of the United States and state surveys, numerous engineers and prospectors, many of the important mineral-bearing zones have been localized. They occupy numerous small, widely scattered areas throughout the vast regions in which mines are found.

A few examples are cited:

Utah has an area of 82,000 square miles; nearly 90 percent of its ore value of more than $2,200,000,000 came from three districts: Bingham Canyon, Park City, and Eureka (Tintic) with an aggregate area of less than 2,000 square miles or about 2.5 percent of the area of the state. Future production from Utah will probably have similar ratios for the districts named and the remaining area.



George M. Fowler

Montana's mineral production exceeds $2,800,000,000 and 77 percent of this value came from a few square miles around Butte.

Arizona's mineral production to date exceeds $3,100,000,000. The chief mining centers, which aggregate only a few hundred square miles in extent, are Bisbee, Ajo, Morenci, Jerome, and Miami-Superior.

In Colorado numerous mining camps, each only a few square miles in extent, contribute the mineral wealth of the state.

In the Tri-State district (Missouri-Kansas-Oklahoma) mineral deposits are known over an area of 2,000 square miles but more than 75 percent of the production of about $950,000,000 came from an aggregate of 30 square miles around Webb City, Mo., and Picher, Okla.

Each of the mining districts mentioned, some in igneous and some in sedimentary rock, is a major center of structural deformation and shattering which preceded ore deposition and created favorable reservoirs for the ore-bearing solutions.

Structural deformation is one of many factors that control the localization of ore bodies. Recognized essentials are

(a) a source material,
(b) channelways through which the source material may travel, and
(c) reservoirs in which this material may be deposited.

The size of the ore deposit is directly related to the quantity of source material and the character of the channel-ways and the ore reservoirs, optimum conditions being abundant source material and favorable channelways and reservoirs.

Zones of intense shattering and little movement are particularly favorable for ore deposition when all the conditions stated above are present. These zones range in size from a few cubic feet to many thousand cubic feet. In many cases parts of them are lean or barren as these parts resisted deformation or were outside the path of it. These conditions are common in nearly every mining district.

Many mining districts and vast areas throughout the country remain to be studied in part or in their entirety. The reward from these studies will far exceed the expectations of the present day ore searchers. Mining geologists who follow us in the quest for ore deposits will be keener observers and much better equipped investigators. They will also have a better knowledge and understanding of many allied factors, including chemistry and geophysics. Their opportunities will be limited only by their ability to understand and solve their problems.

MR. JORALEMON sets up three types of problems: (1) large ore-bodies, for which careful geological work is necessary in the guidance of their development; (2) the smaller properties in which the problem is one of equating expense to possible output; and (3) the examination of new mines and prospects. To this list I would add a fourth type, namely the

Francis A. Thomson

examination of old mines, closed down, not because they made too much money, obviously, but for one reason or another, some of which perhaps justify examination with a view to possible reopening in the light of the new geology and the new metallurgy, and the availability of cheap power.

Of the greatest future importance, however, is an entirely different type of ore-finding problem. Let me illustrate what I mean:

Mr. Reno Sales * drew a word picture for us of what we would have found if we had arrived at Butte before a thousand feet or so of erosion had removed the upper crust, as it were, and with it the zinc-lead deposits which we presume characterized the upper reaches of the present copper veins. Now, if we make another assumption, namely that not only had erosion not taken place but that a large sheet of rhyolite had been poured out at the non-eroded surface we then have the picture of a rhyolite-covered country with prolific ore deposits below and no surface showings whatever to indicate their presence.

This is what confronts the mining geologist and the miner of the future: namely, to find methods for discovering those ore deposits which undoubtedly exist in certain areas, but not only fail to show the kind of outcrop which even Kellogg's jackass could discover, but of which there is not the slightest surface evidence.

The problem of the application of detailed scientific methods, where to apply them and when to apply them, is, of course, a problem that admits of no particular solution; that is, there is no pat solution, and it comes back finally to the judgment of the man who is responsible for making the examination and "doing" as we say, the geology of the mine.

And I am happy to note that Mr. Joralemon in addition to recognizing the contribution which careful and detailed scientific work can make, believes that there are other factors in mining success.

It was Carlyle who defined genius as "an infinite capacity for taking pains," but there is more to genius than that, and Mr. Joralemon knows it and gives proper place to those twins of real genius, intuition and "hunch." Out of his experience he also recognizes hope and chance as important factors because, in spite of all that the most meticulous geologist may be able to do, there still remains—and I trust there always will remain in the mineral industry—this indefinable element of luck and of risk that is involved in all mining operations, and which now and then, of course, happens, to bring great returns, even as sometimes the little white ball happens to drop into the right segment of the spinning wheel.

In closing this very brief discussion, I want to mention two incidents that I have quoted before but which I think are entirely illustrative of the attitude that not only the geologist, but everybody else connected with the finding of ore, must keep in mind.

It was the late great Frederick W. Bradley who said to me in a private conversation when I asked how he was getting along with a certain property they had under operation in a state where I was living at that time, "We are in the hands of our Mr. So-and-so, and I am afraid he is going to throw the thing up. He is a young man and he hasn't learned yet that *sometimes you have to be very patient with some of these prospects.*" That idea of personifying a prospect and of "being very patient with it," was a new one to me, and it struck me as of great significance coming from a man of Mr. Bradley's wealth of mining experience.

Then, there is the good old story of Marcus Daly which, with limitations, has its obvious moral.

In the old days, before we knew even what little we now know about the science of ore deposits, Marcus Daly had a scout hunting around for new properties. Every now and then this scout would come back to headquarters and report to Mr. Daly that he hadn't been able to find anything he could recommend. This went on for several years until, Daly, an Irishman subject to bursts of impatience, finally said, "Young fellow, why in the hell don't you get reckless and spend forty or fifty thousand dollars once in a while for me? If you did that you might find a mine."

Sherwin F. Kelly

I WANT to call attention to one line of approach to geological data which has been implicit in what has been said, but which I should like to make explicit. It is a line along which mining geology, in my opinion, must progress if it is to get anywhere, and the line along which mining geologists of the future should be trained if they are to achieve progress in the science of geology, in the art of ore finding, and in the furthering of our knowledge of earth phenomena.

The problems of geology, and of mining geology in particular, are essentially those of physics and chemistry. The problems of major geological structure which affect the loci of ore deposition, are fundamentally ones in physics and mechanics. The circulation of ore depositing solutions, or fluids, or melts, through the host rocks again brings us back to the concepts of physics, of chemistry, and of physical chemistry. Essentially chemical in nature is the problem of precipitation of the ore-bearing minerals from the fluids transporting them. Evidently, if the geologist is to have any more than a purely superficial appreciation of the formations engaging his attention, he must understand the fundamentals of mechanics, physics, and chemistry.

The imagination which Mr. Joralemon said must put itself in the place of the ore-depositing fluid must be an imagination which is trained in, but held in leash by, the knowledge of physics and of chemistry.

So the geologist of the future must tackle the problems which he encounters in the field, not only from the point of view of observing and recording the phenomena which he sees, but he must also tackle them with the equipment of the physicist and the chemist. He must have the point of view of the physicist and the chemist. He must use their techniques, their laboratory techniques, and he will have to take those laboratory techniques into the field with him, at least in imagination, and bring back his

(*Continued on page* 68)

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* Complete text of Mr. Sales address will be carried in the January, 1941, issue of The Mining Congress Journal.—Editor's Note.

SICK ABSENTEEISM in the Non-Ferrous Mining Industry*

By ANDREW FLETCHER
Vice President and Treasurer
St. Joseph Lead Company

Editor's Note: Mr. Fletcher's address was followed by an interesting discussion by Stanley A. Easton, President of the Bunker Hill and Sullivan Mining and Concentrating Company, of that company's ultra violet ray solarium, which has been described in the May, 1940, issue of MINING CONGRESS JOURNAL.

THAT absenteeism in industry because of sickness represents enormous wastage to employes due to loss of wages, to industry due to loss of earnings, and to our country due to lower production during this period of national preparedness, is indicated by the following statement of Dr. A. J. Lanza of the Metropolitan Life Insurance Company from his paper entitled "Sick Absenteeism in Industry" which has recently been printed by the Air Hygiene Foundation of Pittsburgh:

"Eight-plus days per male wage earner and twelve-plus days per female worker per year is the average toll paid to disabling sickness and injury—a staggering total, whether viewed from the point of health or of money loss, and at least five times greater than the corresponding figure for industrial accidents."

Urges Competent Figures and Information on Sick Absenteeism

In order to approximate the dollar and cents result of the sickness loss, and as there are no competent figures for non-ferrous mining and smelting, we will assume that this same ratio of eight days is also suffered by our industry.

The average lead wage paid per shift at the present time is probably about $5.75, and the number of employes in lead mining and smelting is in the neighborhood of 12,000. The wage loss due to absenteeism can be reasonably estimated at between $550,000 and $600,000 per year. As the wages and salaries paid for mining and smelting is in the neighborhood of 1.7 to 2.0 cents per pound of lead produced, the lost production is possibly around 15,000 to 16,000 tons of lead per year, which has a market value of around one and a half million dollars.

Based on the estimate of the American Zinc Institute, there are approximately 16,000 men currently employed in zinc mining and smelting. With an average wage of $5.50 per shift, the wage loss due to sickness would be about $700,000 per year. The present rate of production is around 52,000 tons per month; therefore, the loss in output would approximate 16,000 tons of zinc per year, the market value of which would be in the neighborhood of two million dollars.

The only purpose in giving this very rough approximation of over one and a quarter million dollars lost wages, and three and a half million dollars lost production is to emphasize that it would certainly seem deirable for our industry to at least obtain competent figures and information! If I can leave this single thought with you, the time which we have spent may be classed as truly constructive, because when the facts are available, we will once more be able to develop a workable solution for the sickness problem, as has already been done with safety, labor turn-over and other operating difficulties.

St. Joseph Lead Company Makes Study

Last December the St. Joseph Lead decided to make a study of sick absenteeism as under the present limitation of 40 to 42 hours per week, it is very difficult for a man to make up lost time, and also because we definitely believe in the policy that improvement in working conditions is an excellent investment. We have no hesitancy in saying that this conclusion has been reached from the dollar and cents angle, and not because of any altruistic or paternalistic motive. The average American workman is no different from the average executive—he knows that he does not receive something for nothing, and, therefore, we have been quite honest in stating that pension and life insurance plans, improved working conditions and better housing were made available for employes because the company made money from these expenditures. In a paper which I presented to the Air Hygiene Foundation entitled "The Viewpoint of an Employe Towards Industrial Hygiene," the dollars earned by this "improvement" policy of the company was indicated, and today I will endeavor to continue this thought by suggesting that improvement in employe health will probably be just as advantageous an investment as improvement in working conditions.

Dollars Saved by Safety Program

In order to again emphasize the dollar angle, it is necessary to give a few figures to serve as a basis of comparison. The dollars saved by the safety program of the Southeast Missouri Division of the St. Joseph Lead is shown by the following:

Back in 1923, about 10 cents per 100 dollars of payroll was spent by the Safety Department in its work, and the cost of accidents was 3.51 dollars per 100 dollars of payroll; whereas last year the company spent one dollar per 100 dollars of payroll for Safety Department expenses, and the cost of accidents was 1.09 per 100 dollars of payroll.

The comment might be made that due to the safety expense increasing 10 times, and the accident cost being cut only about 70 percent, the actual saving is merely the difference in total cost, which is 1.52 dollars per 100 dol-

* Presented Annual Metal Mining Convention, Western Division, The American Mining Congress, Colorado Springs, Colo., September 16-19, 1940.

lars of payroll (3.61 — 2.09). This is true, but the total saving is far greater than 1.52 (although this direct saving amounts to about $65,000 per year), because it does not include the hidden indirect costs, which are the extremely adverse effects of an accident on a man's own person and on his family, the expense of replacing an injured man with the resultant increased cost of supervision, spoilage of any material, and lower output, plus the cost of repairing equipment that may have been damaged in an accident. Mr. Harrington, Chief of the Health and Safety Branch, U. S. Bureau of Mines, makes the startling estimate that these indirect costs amount to three times as much as the direct costs.

It is not believed that our company can obtain any further appreciable dollar savings by improved safety, as a direct accident cost of 1.09 dollars per 100 dollars of payroll is low—however, if a method can be developed to lessen the time lost through sickness; then, we will be able to again lessen the enormous indirect costs. In fact, the indirect savings may be much greater as a man is usually working efficiently up to the time of an accident, whereas, in the case of time lost in sickness, the employe does not do a full day's work before or just after he is forced to lay off.

Research Eliminating Occupational Hazards

In recent years, we have all heard a great deal about the occupational disease of the mining industry—silicosis, but I am of the very definite opinion that no serious hazard any longer exists in operations that are even relatively well handled, and need not be further considered where dust counts are maintained within the limits prescribed by the State of New York, which are 100 million particles per cubic foot of air for rock with a free silica content of less than 10 percent, and 10 million for rock with more than 10 percent. These concentrations can be obtained in most instances with relatively little expense, and I believe that the cost of dust removal is well worth while, even if the dust is not considered hazardous, and even though a study recently made by Messrs. Lanza and Vane, published under the title of "Industrial Dusts and the Mortality from Pulmonary Disease," indicates that there is apparently no relationship in the incident of tuberculosis and the amount or character of dust, with the exception of silica and asbestos. In connection with the other occupational hazard that our industry has faced in times past—lead poisoning, this disease need no longer be feared, thanks to our present knowledge resulting from the brilliant medical research at Harvard, Cincinnati and Washington. Therefore, we have no real occupational hazards, and only need to consider the illnesses that other industries are facing and seriously studying.

Factors Affecting Sick Absenteeism

Reduction of lost time from illness presents many more problems than reduction of lost time from accidents, as in addition to working conditions and employe attitude, sick absenteeism is affected by the employe's home life, his housing, his food, his ability to get prompt and efficient medical service and, above all, the general sanitary conditions in the locality in which he lives. In this connection, it is my belief that to correct the conditions stated to have been found by the Tri-State Survey Committee in the Joplin area last winter, and reviewed by Dr. Alice Hamilton in her article entitled "A Mid-American Tragedy" in the August issue of the *Survey Graphic*, much more study and effort should probably be made towards securing improvement in living and conditions above the ground than in working conditions below the ground.

The St. Joseph Lead has for the last 20 years been seriously interested in the general health of the communities in which its principal operations are located. If our employes become seriously ill, they usually obtain satisfactory medical aid and, if necessary, hospital service. Often employes are examined by our doctors and, in such instances, the men are given the benefit of any information that might be helpful, contingent, however, upon the ethics of the medical profession. These may be some of the reasons why the following figures for our Southeast Missouri division indicate that the absenteeism from all causes including personal reasons is only 6.3 days per year (2.43 x 260 shifts) instead of the average stated by Dr. Lanza of eight days for the United States, which figure moreover only covers accidents and sickness. If we consider only illness, then the loss is between 4 and 4.5 shifts—but it may be that this favorable showing is because the 31 week period is not truly representative of the experience that would be obtained over a period of years.

In order to convert the figures in the column headed Percent Absenteeism into cases per thousand employes, which is the method used for comparative purposes by many companies and the U. S. Public Health Service, it is only necessary to multiply the figures

Underground scene southeast Missouri mines, St. Joseph Lead Co.

by 10—for example, the .48 percent absenteeism due to influenza, grippe and colds is equivalent to 4.8 cases per thousand employes. The total for all respiratory diseases is .67 percent or 6.7 cases per thousand employes. Although this figure is about four times that due to industrial injury, the 6.7 cases makes an extremely satisfactory showing in comparison with the 1939 figure of 33.9 cases published under date of August 2, 1940, by Mr. Gafafer, Senior Statistician, United States Public Health Service, in his report covering a group of over 170,000 male members of 26 industrial sick benefit organizations throughout the United States.

Suggests Procedure for Obtaining Sick Absenteeism Information

Unfortunately, our company does not have "facts" upon which to base conclusions as to why so much more time is lost because of sickness than due to accidents and, from the inquiries made to other mining companies, adequate information does not seem to be available anywhere. In order to obtain the necessary data, without which no constructive and corrective steps can be readily taken, the following procedure is suggested:

1. Each mining company, who is interested in lessening losses due to sickness, should place the responsibility with some department or individual to collect information on absenteeism.

In this connection, the forms for listing information recently issued by the Air Hygiene Foundation are entirely suitable and are based with the thought of aiding the U. S. Public Health Service in their study of conditions throughout the United States.

If merely this so-called "reporting" step is taken, I am sure that immediate and sizable benefits will be obtained through the lessening of shifts lost, provided the initial approach is tactfully made, and employes do not feel that the company is encroaching on their personal liberties and family life—it must be expected that until the sincerity of the company's investigation is appreciated and until employes thoroughly understand why the study is being made, certain individuals will report an afternoon spent at a ball game as a day in bed with a cold, or even use the old schoolboy excuse of attendance at a grandmother's funeral!

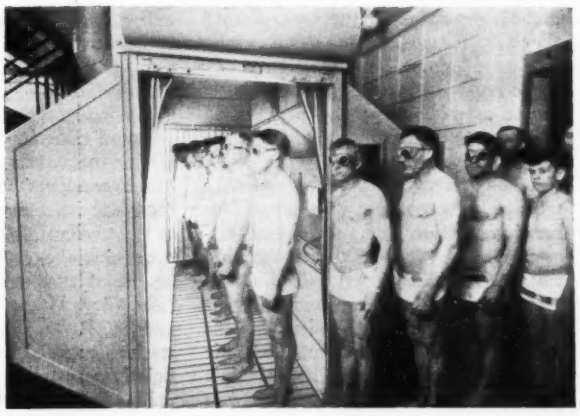
2. When the information has been collected over a period sufficiently long to eliminate exceptional conditions, then the comparative data should be carefully studied. I am assured by the Air Hygiene Foundation that they would welcome the opportunity to examine any records submitted by a mining company. The information would be considered as confidential, if desired, and only the total figures would be included in their study of sick absenteeism throughout the United States.

The mining industry has quickly and economically handled problems of production, sales and financing, and there is no doubt but that we can obtain similarly satisfactory results in improved employe health provided we have "facts" to work on. With 12 times as many shifts lost through absenteeism as in accidents, the opportunity is very great to obtain large dollar earnings—I use the word "earnings" as the old saying is still true "a dollar saved is a dollar earned."

ST. JOSEPH LEAD COMPANY—SOUTHEAST MISSOURI
ABSENTEEISM REPORT FOR THIRTY-ONE WEEK PERIOD ENDED 7 A. M. AUGUST 4, 1940

Reason for absence	Shifts lost	Percent absenteeism based on 380,637 expected shifts of work	Percent of total shifts lost	Losses of 15 or more shifts by individual employs. No. of empls.	No. of shifts lost
Industrial injury	634	.17	6.85	9	442
Non-industrial injury	456	.12	4.93	5	214
Influenza, grippe and colds	1,826	.48	19.74	6	115
Nasal fossae and annexae	197	.05	2.13	2	180
Bronchitis	16	..	.17	1	16
Pharynx and tonsils	175	.05	1.89	2	40
Pneumonia	101	.03	1.09	3	79
Respiratory tuberculosis	142	.04	1.54	1	142
Other respiratory diseases	66	.02	.71	2	48
Total respiratory diseases		.67			
Teeth and gums	91	.02	.98	..	..
Stomach, except cancer	328	.09	3.55	3	67
Diarrhea and enteritis	15	..	.16	..	..
Appendicitis	212	.05	2.29	8	180
Hernia	14	..	.15	..	..
Other digestive diseases	66	.02	.71	1	15
Heart	299	.08	3.23	4	296
Hemorrhoids	13	..	.14	..	..
Other circulatory diseases	99	.03	1.07	1	95
Genito-urinary diseases	254	.07	2.75	4	202
Neuralgia, neuritis and sciatica	16	..	.17	..	..
Other diseases of nervous system	1	..	.01	..	..
Organs of vision	42	.01	.46	1	24
Ear and mastoid process	27	.01	.29	..	..
Rheumatic diseases	180	.05	1.95	3	76
Lumbago, myositis, etc	172	.04	1.86	..	..
Skin diseases	80	.02	.87	1	53
Infectious and parasitic diseases	199	.05	2.15	1	100
Cancer, all sites	141	.04	1.53	3	141
Ill-defined and unknown causes	1,408	.37	15.22	12	244
Illness or death in family	1,000	.26	10.81	..	..
Miscellaneous personal reasons	981	.26	10.60	3	51
Total	9,251	2.43	100.00	76	2,820

This report includes payroll men for entire 31 week period and salaried men who are limited to maximum hour provisions of the Fair Labor Standards Act for nine weeks ended 7 a. m., August 4, 1940, only.



Group of workers being carried through the Solarium at Bunker Hill and Sullivan

Trenching for chromite, Grant Co., Oregon

Development and Production of Domestic Supplies of Strategic and Critical Minerals

By SAMUEL H. DOLBEAR
Consulting Mining Engineer
New York

NO MILITARY strategist will dispute the wisdom of making the United States independent insofar as possible of foreign sources of materials required for the successful conduct of war. There is, however, a conflicting school of thought on the desirability of a prewar production from domestic deposits of the so-called "war minerals." One group has contended that stock-piles of foreign ore should be accumulated, leaving domestic ores in the ground until they are needed. A second group holds that domestic deposits are not to be regarded as readily available reserves, as much time and preparation is needed in most cases to bring these reserves into production. The latter viewpoint is without doubt generally true. Furthermore, a product of domestic operation is the search and discovery of new deposits. Recognizing this, the National Defense Commission may be said to be committed to a policy of encouraging the development of, and production from, domestic sources at this time. The principle has also been recognized by Congress in its acts appropriating funds for the Bureau of Mines and Geological Survey to enable them not only to study regions in which deposits are known to exist, but to actually explore promising occurrences, and to conduct research work on the beneficiation or other utilization of low-grade and off-grade ores.

Discretion as to the location, character and extent of this work is entirely in the hands of these two bureaus and this work is being now prosecuted with all the equipment and men permitted by current available appropriations. The Geological Survey conducts geological studies aided in some cases by geophysical surveys, while the work of the Bureau of Mines conducts actual exploration of the deposits by diamond drilling or other exploratory work necessary to determine the probable character and extent of these occurrences. At Salt Lake City, Utah; Boulder City, Nev., and at Rolla, Mo., the Bureau has stations engaged in the study of beneficiation, metallurgical treatment and utilization of ores. Research is conducted on ores of such types as are known to exist in sufficient quantities to play an important part in the defense plans. Obviously, it is impossible to attempt such work on the ores of small individual mines, the

number of which is legion. Where deposits are privately held, the work is done under contract with owners. The terms give the Government access to the property and the right to do such work as it deems advisable. The owner is provided with a map showing the work done and results obtained, and incurs no financial liability for expenditures made. Strategic minerals are given precedence over those in the critical list.

Strategic and Critical Minerals

Strategic Materials

The official definition of strategic materials is as follows:

> "Strategic materials are those essential to national defense, for the supply of which in war dependence must be placed in whole, or in substantial part, on sources outside the continental limits of the United States; and for which strict conservation and distribution control measures will be necessary."

The minerals included in this list are: Antimony, chromium, manganese (ferrograde), mercury, mica, nickel, quartz crystal, tin and tungsten.

Critical Materials

The official definition of critical materials is as follows:

> "Critical materials are those essential to national defense, the procurement problems of which in war would be less difficult than those of strategic materials either because they have a lesser degree of essentiality or are obtainable in more adequate quantities from domestic sources; and for which some degree of conservation and distribution control will be necessary."

Minerals classified as "critical" are: Aluminum (presumably including bauxite), asbestos, graphite, iodine, platinum and vanadium.

Stimulation of Domestic Production

Acts of Congress intended to encourage development of domestic supplies are as follows:

1. Domestic producers are encouraged under the "Buy American Act" under which a higher price may under certain circumstances be paid for the American product.
2. The Reconstruction Finance Corporation is authorized to make loans for the development, equipment and operation of these deposits.
3. Profit derived from the operation of certain of these minerals has been made exempt from the excess profits tax.

Excess Profit Taxes

In recently (1940) enacted excess profit tax laws, some, but not all of the strategic and critical minerals are exempt from the Act. Exemptions were made in the following language:

> "Income derived from the mining, reduction, or beneficiation of tungsten, quicksilver, manganese, platinum, and antimony, chromite and tin, or the ores and material containing such metals, shall not be subject to the excess-profits tax provided for in this Act."

Minerals listed as "strategic" by the Army and Navy Munitions Board but not exempted are: Mica, nickel, and quartz crystals.

Of the group classified by the Board as "critical" only platinum is exempt, leaving aluminum, asbestos, graphite, iodine and vanadium subject to payment of the tax.

This amendment accompanying the exemption was introduced by the late Senator Key Pittman and it is not clear why the language of the amendment failed to include all strategic and critical minerals. Certainly the logic of exemption is the same in vanadium, for example, as for platinum or antimony.

Sale of Minerals to Government

Procurement Division—U. S. Treasury

Until recently this has been the sole purchasing agency for minerals acquired for stockpile purposes. Under the rules and restrictions imposed by law, certain routine necessary to protect the interest of the Government and to assure that the material contracted for will be delivered in the time, quantity and quality desired makes sales through this agency burdensome for the ordinary small domestic producer.

(1) Minimum tonnages are required in each contract. In the case of chromite, for example, the amount of 1,000 tons. Inasmuch as a large number of chromite deposits in the United States have yielded but a carload or two, the miner with such a deposit is barred from that market. Even in cases where the yield has been as much as 1,000 tons, only a small part is usually in sight at any one time, and short of actually mining out and accumulating the full amount in advance, few operators would be justified to enter into such a contract. Accumulating this tonnage also requires more capital than most small operators possess.

(2) The holder of a contract is required to post a bond guaranteeing fulfillment of the contract, particularly when the proposed production cannot be proven to be economically feasible at the price of the contract. This bond may be for 20 percent of the amount of the bid. Small operators are seldom able to provide such a bond.

(3) Freight must be prepaid by the shipper to the point of delivery specified by the Treasury. This may involve an additional capital requirement of $15 per ton or more.

(4) Purchases were formerly made on the basis of formal bids. This has now given way to negotiative sales which is much simpler.

(5) Domestic ore purchases are encouraged under the "Buy American Act," permitting payment of somewhat higher prices to domestic producers.

The Reconstruction Finance Corporation has lately taken over the purchasing of some of these substances, but the Treasury Department as of October 21, 1940, was still the sole purchaser of the following stockpile materials:

Mercury
Tungsten (with certain exceptions)
Mica
Quartz crystal
Chromium of metallurgical grade, having a minimum of 48 percent Cr_2O_3, maximum of 8 percent silica and a chromic iron ratio of not less than 3 to 1.
(Other grades of chromite are purchased by the Reconstruction Finance Corporation.)

Under the law, purchases made by the Government for its emergency stockpile may not be sold when the present emergency is passed. The stockpile must be held indefinitely unless supplies in private hands have been exhausted, in which case industry will requisition its requirements from the Government stockpile. This results in exceptional caution in the accumulation of only high-grade supplies, available normally from foreign sources in adequate amounts but increasingly difficult to obtain at present.

Reconstruction Finance Corporation

To overcome this difficulty the R. F. C. is enabled to make purchases of ores other than those specified by the Army and Navy Munitions Board, with whom rests the decision as to what may be purchased by the Treas-

ury Department for stockpile purposes.

The R. F. C. may also purchase supplies on any terms it deems advisable, and so may take domestic ores in any quantity offered and pay for them at the point of shipment. Without this, much of the development and production by small operators could not be sold directly to the Government.

Minerals which may be sold to the R. F. C. at present are:

Manganese
Tin
Tungsten (under certain circumstances)
Chromium of grades below metallurgical, and domestic metallurgical if the producer is unable to conform to terms of the Treasury Department
Asbestos (African amosite and Blue fibre)
Graphite may later be included.

Of the "strategic" group these Government agencies are purchasing no nickel, and in the "critical" group no aluminum, vanadium or platinum. The Reconstruction Finance Corporation is not bound by the regulations which govern Treasury purchases, and it may, therefore, acquire stocks of minerals considered necessary for defense even if below grades specified by the Army and Navy Munitions Board. Such stocks can be made available to industry if needed and may be liquidated when the emergency is over. Purchases currently authorized in this class are chrome ores classified as "chemical" and "refractory" ores.

The R. F. C. may also make purchases on behalf of the Treasury. The R. F. C. purchases are made through the "Metals Reserve Company." This is a wholly owned subsidiary of the R. F. C. set up in recent months to handle the R. F. C. activities in the purchase of metals and ores. Sales of ore and contracts of sale made by the R. F. C. are, therefore, handled through this organization.

A plan has been advocated in some quarters to set up purchasing depots at various points in the country where ore in single carload or even truckload lots would be accepted. This has not been adopted as yet, and possibly will not unless the need for this becomes more evident than at present.

Points of Delivery and Storage

Points of delivery are designated by the Procurement Division of the Treasury only for chromium at New Cumberland, Pa.; tungsten and quicksilver at Columbus, Ohio, and manganese at Baltimore, Md. No other designations have been made.

Points of delivery are designated by the Metals Reserve Corporation (R. F. C.) only for manganese at Baltimore, Md., and pig tin at Columbus, Ohio. The Metals Reserve Corporation may, at its option, take delivery of supplies at any other point deemed expedient, thereby relieving the shipper of the necessity of prepaying freight.

Sales to Industrial Consumers

Domestic manufacturers are in the market for minerals and metals if they are available at prices in line with those quoted for imported goods.

In those materials where consumers have acquired large stocks, there is no apparent anxiety among manufacturers to bid for domestic supplies as yet.

If large production is anticipated, producers may negotiate directly with large consumers. Smaller operators may find it an advantage to deal with established metal brokers who are able to maintain close contact with markets.

If local markets exist they should be explored for possible outlets and realize that prices may in some cases be greater because relatively high freight rates must be paid for some of these commodities to get them to stockpile or to distant consumption points.

Lists of users and dealers, revised from time to time, may be obtained from the U. S. Bureau of Mines, Washington, D. C.

Prices

Neither the Treasury Department nor the M. R. Co. release schedules at which they are prepared to make purchases. Inquiries bring the suggestion that the intended operator estimate his cost of production and submit a fair offer based on this estimate. Such a plan might be followed by a mine already in production, but it is not helpful to one who seeks to determine if prices are high enough to indicate a possible profit if operation is undertaken.

The potential operator cannot commit himself in advance of prospecting and development to a price based on a cost of production which obviously cannot be foretold. The prospector and intending operator must exercise his judgment as to what he may expect so that if prices are so low that no profit could result, he will not be wasting his time and resources on futile effort, but will seek some other field where the possibilities are brighter. Otherwise he cannot cooperate effectively in the national defense plan.

A more open policy on prices appears needed if the Government is to assist effectively the development and production from domestic deposits.

Certain technical papers publish prices of these and other mineral substances. In many cases it is difficult to obtain accurate information as to selling prices because they are known only to a small number of buyers and sellers, and the prices quoted by opposing factions are seldom in agreement. This is recognized by such publications as the *Engineering & Mining Journal*, who make a practice of qualifying prices with the words, "Quotations nominal." This is intended as a warning of inaccuracies and it has been observed that many times the prices quoted vary widely from some actual transactions.

The U. S. Treasury, through its Procurement Division, Procurement Building, Washington, D. C., is authorized to encourage domestic production under the "Buy American Act," and may pay somewhat higher prices for domestic products than for the equivalent foreign material.

Specifications

Specifications to which minerals must conform in the Government stockpiling program will be furnished upon request by either the Procurement Division of the Treasury or the Metals Reserve Company. Those issued by the former agency have been previously published but have been recently changed in certain respects as given below under the respective subjects discussed.

It may be said that the Government is infinitely more exacting in its specifications than is industry. Within reasonable limits the acceptance of off-grade material by industry is largely dependent on price, but if the producer has the misfortune to find himself stocked with off-grade material, this should not be shipped before the purchaser has been consulted and definite arrangements concluded.

Freight Rates

Freight rates to points of consumption may generally be obtained from local freight agents. It should be borne in mind, however, that there are two classes of rates, viz: Class rates and commodity rates. Commodity rates are quoted usually at substantially lower levels than exist

for class rates, but must be published by the authority of the State or Interstate Commerce Commissions upon application of the shipper. Railroad freight agents will usually submit the application for a desired commodity rate on written or verbal application by the intended shipper without cost. If the tonnage movement is, however, to be very large the shipper may gain something by employing an attorney familiar with the procedure to handle the application.

Government Loans

Section 5, Publication No. 664, 76th Congress, confers authority on the Reconstruction Finance Corporation to grant loans for the development and production of strategic and critical minerals. These are divided into two classes:

Development Loans

Loans for development purposes may be made in amounts not to exceed $40,000 for any single property and the R. F. C. has issued a circular as follows:

"INFORMATION REGARDING DEVELOPMENT LOANS

"Development loans may be made to corporations, individuals and partnerships engaged in the development of deposits of gold, silver or tin, or any strategic or critical mineral. An application for one of these loans must contain data to show that there are exposures of ore or mineral within the mining property either on surface or in the mine workings which warrant development.

"In the case of a vein or lode mine, this information should consist of a map of the mine workings upon which is shown the location of every sample taken of the ore exposed by these workings, the width of ore each sample represents, and its assay values. A description of the method used in taking these samples is essential. On this map should be outlined the proposed plan of mine development. The application should contain the applicant's estimate of the cost of doing this work and an estimate of the amount and analysis of the material expected to be developed by the program. An estimate of all proposed expenditures from loan funds is requested. The application should include an inventory of all usable equipment on the property. If new equipment is to be purchased, a list and description of it and an estimate of the cost of the same is desired. The application should contain complete information concerning the source and cost of water and power and a detailed statement of the applicant's expenditures to date on its property.

"If the property to be developed is of the placer type, the application should contain a map of the property on which is shown the location of every shaft or drill hole that has been sunk to prospect the property, and the value per cubic yard that was recovered from the gravel of each shaft or drill hole. If holes were drilled, the log of each hole should be submitted. A detailed description of the method used in making the value determinations is very essential. The proposed plan of development work to be carried on from the proceeds of the loan should also be shown on this map. The application should contain the applicant's complete estimate of the cost of doing the development work and of the yardage and value of gravel that is expected to be developed. Complete information concerning the source and cost of water and power, and a detailed statement of the applicant's expenditures to date on its property should likewise be submitted.

"Development loan applications should contain a detailed statement of the applicant's plan of operating the property after the development program has been completed. It is important that this statement give full information concerning the financing of the operation.

"Loans will not be considered on mining properties the ore bodies or mineral deposits of which are under water or, due to caving of the mine workings, are inaccessible for examination by one of this Corporation's engineers. Loans are not made for the purpose of making such deposits accessible or for the purchase of mining properties.

"Development loans are made solely for the development of deposits of gold, silver or tin, or any strategic or critical mineral, and are not made for prospecting or grubstaking purposes. This type of loan is not made for the construction or purchase of mill equipment.

"The Corporation does not look with favor upon granting a loan to an applicant who has only a leasehold interest in its mining property. It is desired that the Corporation be given a mortgage on such property. However, if the property is held under lease or option to purchase, a loan may be considered provided that the owner of the property joins in the mortgage or provided that such owner agrees to modify the lease in such particulars as this Corporation may require and to keep it in effect as long as any part of the loan is outstanding and to subordinate all land or royalty payments to the loan.

"The rate of interest is 6 percent.

"Mining loan applications are filed in duplicate with the Washington office of this Corporation.

"October 1940."

If a development loan is being considered, the intending applicant should write to the Reconstruction Finance Corporation, Washington, D. C., and ask for a copy of Form R. F. C. L-254 (Revised 9-23-40) entitled "Application for a Development Loan." The applicant will save much time and trouble if he is able to secure expert advice in the preparation of the application and the report of a mining engineer, prepared so as to specifically answer the questions asked, and to provide proper maps (especially the assay maps of the mine), analyses and other factual evidence required. Mining engineers representing the R. F. C. are located at various central points and are ready to advise in these matters without charge. They do not, however, make examinations and reports on mines prior to the filing of an application, and then only to check reports and data submitted by the applicant.

It is helpful, although not specifically required, that the services of an auditor be secured in the preparation of a balance sheet when called for by the R. F. C.

In applying for a development loan it should be realized that there is a difference between prospecting and development. Development loans are only made on known exposed ore which appears sufficiently important to justify the conclusion that development will result in a commercial operation.

Primitive placer tin operation

The intending applicant should not count on any "political pull" that he may be able to exert to make up for deficiencies in the facts.

General Mining Loans

The R. F. C. issued a circular describing these loans as follows: R. F. C. Form L-197 (Revised 7-10-40) entiled:

"INFORMATION REGARDING GENERAL MINING LOANS

"General mining loans are made to recognized and established corporations, individuals and partnerships engaged in the business of mining, milling or smelting ores. The Act which authorizes these loans provides that they be made upon sufficient security. This security may consist of a lien on real or personal property, entirely independent of the mining project, which, in the opinion of this Corporation, constitutes sufficient security; or it may consist of a mortgage on the mining property. If the mining property is to be the security for the loan, it must contain blocked-out ore, the net value of which could be considered as offering sufficient security for the amount of the loan requested.

"In order that the engineers of the Mining Section can determine whether or not a property meets this statutory requirement, it is necessary that the application contain detailed maps of all the mine workings upon which are shown the location of every sample taken of the ore exposed by these workings, the width of the ore that each sample represents, and its assay value. A detailed description of the method used in taking the samples and of computing the ore reserves is desired. The application must contain complete information concerning the method and the estimated cost per ton of mining the ore. If the construction of a mill with loan funds is contemplated, a flow sheet of the proposed plant must be submitted, together with copies of all metallurgical tests of the ore. The applicant's estimates of the cost of purchasing and erecting the mill and of the cost per ton of milling the ore should likewise be submitted. If the ore is to be sold to a custom mill or smelter, it is essential that the application contain copies of the contracts with such mill or smelter for the purchase of the ore.

"The application should give complete information concerning the source and cost of water and power.

"If the mine is of the placer type, the application must contain a map of the property on which is shown the location of every shaft or drill hole that has been sunk to develop the deposit, and the value per cubic yard that was recovered from the gravel of each shaft or drill hole. A detailed explanation of the method used in making these value determinations is necessary, including the log of each shaft or drill hole. Complete information concerning the proposed method to be used in mining the gravel is desired, together with the applicant's estimate of the cost per cubic yard for doing this work.

"There should also be submitted an itemized statement showing the nature and cost of the proposed expenditures to be made under the loan. A complete description of all equipment now on the property is likewise essential. A detailed statement of the applicant's expenditures to date on its property is also required.

"The application must give complete information concerning the source and cost of water and power.

"Loans will not be considered on mining properties the ore bodies of which are under water or, due to caving of the mine workings, are inaccessible for examination by one of this Corporation's engineers. Loans are not made for the purpose of making such ore bodies accessible except in the case of general mining loans where the security is independent of the mining project. Loans are not made for the purchase of mining properties.

"The Corporation does not look with favor upon granting a loan to an applicant who has only a leasehold interest in its mining property. It is desired that the Corporation be given a mortgage on such property. However, if the property is held under lease or option to purchase, a loan may be considered provided that the owner of the propery joins in the mortgage, or provided that such owner agrees to modify the lease in such particulars as this Corporation may require and to keep it in effect as long as any part of the loan is outstanding and to subordinate all land or royalty payments to the loan.

"The rate of interest is 6 percent.

"Mining loan applications are filed in duplicate with the Washington office of this Corporation.

"October 1940."

If the applicant wishes to expedite action on his application he should use the utmost care to insure that all of the information and data required has been carefully prepared. If the application is found to be deficient in any of these particulars, such deficiency would have to be remedied and it is conceivable that the revised application might find itself at the bottom of the pile to be taken up in its turn. If the application is found to be in order the property would then be examined by engineers employed by the R. F. C. The applicant is required to pay for the examination.

When the Engineering Division of the R. F. C. is satisfied, the applicant will then be requested by the Legal Division to furnish certain additional information and documents such as an abstract of title and if the applicant is a corporation, a certified copy of the articles of incorporation and other necessary papers.

Time may be saved by the applicant if he will determine in advance what is required in these respects and have them in hand for use when needed.

The method of handling the loan is somewhat different from the usual commercial transaction with a bank. Expenditures are budgeted from month to month. Invoices must be approved by engineers and bank representatives of the R. F. C. before funds are made available for their payment, and supervision over expenditures by the R. F. C. is generally much closer than in ordinary commercial transactions. Limitations are placed on executive and technical salaries and it is usually desirable for the applicant to have some resources other than those derived from the loan as a matter of convenience.

Private Financing

Funds from other than Government sources may be found to finance these operations. During the World War shortage of supplies was so acute that large consumers were willing to lend substantial sums to producers against contracts for output. At present no such arrangements are generally available. Investors considering this field should recognize that in many cases operations would have little value except in case of emergency. If England were to collapse it seems probable that some sort of peace in Europe would reopen many of our former sources of supplies. Prices at present are due not only to interruption of shipping, but to the high rates of war-risk insurance.

Investors would, therefore, be wise to insist on terms which will effect a rapid recapture of invested capital. Few, if any, of the large mining companies have any interest in this field. Their rule is generally to participate only in ventures which could be operated profitably under normal peacetime conditions.

Private financing must, therefore, come largely from those with capital not engaged in mining operations.

Strategic Minerals

The possibilities and limitations for development within the United States is briefly outlined below.

Antimony

Formerly this mineral chiefly came from China but in the last few years South and Central America and Mexico have been the chief sources. The only primary antimony smelter in the United States is located at Lorado, Tex., which operates largely on ores from Mexico. A new plant, however, will be operated at Kellog, Idaho, for the smelting of domestic ores. Consumption in the U. S. of this metal from primary sources is normally around 10,000 tons per year of which more than 60 percent comes from Mexico.

Prices are at present around 14 cents per pound and have averaged about 10 cents during the past 10 years.

Known United States resources are limited and most of the deposits are small. The development of an adequate supply in the U. S. is important and the accumulation of a stockpile is regarded as essential. As a substitute for antimony in the hardening of stor-

age battery plates, calcium and strontium have been used and may, in case of necessity, become important.

Chromite

Chromite should be regarded as three separate products inasmuch as the character, specification and value depends upon the uses for which they are required. These products are: metallurgical ore, chemical ore and refractory ore.

Consumption of all grades of ore in the United States at present is in excess of 500,000 long tons per year.

Chromite ore of metallurgical grade has been found on the Pacific Coast and in Alaska but so far production of high grade material has been in minute fraction of domestic requirements, even in 1918 when domestic production of all grades amounted to about 80,000 tons. While production of high grade lump ore may subsequently come, to some extent, from Alaska or Washington, and smaller amounts from Oregon and California, the chief possibility in the United States seems to be in the production of high grade concentrates.

By metallurgical ore is meant ore which contains not less than 45 percent Cr_2O_3, not more than 11 percent silica and has a ratio of at least three parts of metallic chromium to one of metallic iron. The latter is highly important. To determine this ratio where chromium is reported as Cr_2O_3, it should be borne in mind that the metallic chromium in Cr_2O_3 is 68.42 percent. Where iron is reported as FeO, the percentage of metallic iron present is 77.77 percent of the FeO reported.

The ferro-alloy industry now consumes a large amount of fines and concentrates and the possible consumption at present is 100,000 tons per year or more.

Chemical manufacturers prefer ores containing around 45 percent Cr_2O_3 and are not primarily concerned with the amount of silica, iron or other impurities present. Under normal circumstances it is not economical to use low grade ores but such have been used in cases of necessity. The problem is one of economics.

Refractory manufacturers during the World War utilized much low grade chromite produced from domestic deposits and were concerned chiefly in obtaining a relatively low silica content. Manufacturers have, however, since that time found the importance of a proper ratio of chromium to magnesia alumina iron and silica. Chrome ore such as that produced at the Masinloc Mine in the Philippines appears to be ideal, having a characteristic analysis as follows:

Chromium oxide (Cr_2O_3)	32% Min.
Iron (Fe)	11% Max.
Alumina (Al_2O_3)	25% Min.
Silica (SiO_2)	5% Max.

Somewhat similar ore also occurs in Cuba.

Chromite is not subject to protective tariff.

Manganese outcrop, Lake Sutherland, Washington

Manganese

Only ferrograde manganese is classified as "strategic" by the Army and Navy Munitions Board. This definition, however, is not recognized in the law which exempts its production from the excessive profits tax.

The specifications for manganese ore set up by the Procurement Division, United States Treasury Department, are shown on the following page.

Most of our manganese supplies in the past have come from far off sources. the principal being Russia, the Gold Coast of Africa and India. Of late Brazilian imports have increased substantially and larger amounts are being brought in from South Africa. Supplies from Russia ceased coming in in September, 1940, and it is unseen what may be expected from this source in the near future. Annual consumption in 1937-1938-1939 averaged 705,000 tons of which about 31,000 was derived from domestic deposits. The peak of production in the United States was 311,000 tons in 1918, or about 35 percent of manufacturing requirements in the United States.

While some deposits of high grade ore have been found in the United States, they have been relatively small and the only possibility of rendering the United States self-sufficient appears to lie in the beneficiation of low grade ores. The Cuban-American Manganese Corporation have accomplished this on a large scale in Cuba, taking ores of a grade of 20 percent or less and raising them by flotation to 50 percent or more. The Cuban-American plant is being extended to produce 130,000 tons annually.

Unless larger deposits of low grade material are discovered, it may be necessary to locate central treatment plants in manganese-bearing regions and these may have to be operated on a customs basis. Such plants are already being planned in five localities. The Anaconda Copper Co. is constructing a 100,000 ton concentration plant at Butte, Mont., and lesser plants are being built or considered in other localities.

Prices reported for high grade ferro ore range from 55 cents to 70 cents per unit of 1 percent manganese f.o.b. mines.

Much is heard about the electrolitic process developed by the U. S. Bureau of Mines. The largest installation of this kind is at Knoxville, Tenn., of a capacity of about 1,500 pounds of electrolitic manganese per day. This cannot be regarded as an important factor in the situation as yet, and it seems probable that even with low power rates the cost of production may be much higher than for an equivalent amount of ferro manganese. Stocks in the United States in the hands of consumers are large, possibly representing more than the year's needs even at the present high rate of consumption.

Manganese ores are protected by tariff of ¾ cents per pound of con-

tained manganese. Ores from Cuba are admitted duty free.

Mercury

Spain and Italy are the two most important producing countries in the world with a production of normally over 100,000 flasks annually. Under normal times with an import duty of $19 and with prices at $75 to $80 per flask, production in the United States amounts to about 1,500 flasks per month. Prices, however, rose from about $80 in the first half of 1939 to $205 within the next twelve months, and production is now 3,500 flasks per month. Prices, however, are now around $170 and a recent contract for Government stockpile purposes was reported to be 5,000 flasks at $150 per flask for delivery over ten months. So long as these prices prevail, increasing production can be expected. Intending operators should realize, however, that if due to any change in circumstances, Spanish and Italian quicksilver were made readily available and the consumption for war purposes in Europe reduced, prices would probably undergo radical adjustments. There are large numbers of quicksilver deposits known in the Pacific states and other regions. Export licenses are not granted freely at present although a few hundred flasks are shipped each month to Canada and England.

Tin

From time to time newspapers herald the discovery of tin deposits in the United States and these are always investigated by Government authorities who are intensely interested in learning of any promising domestic properties. While tin is known to occur notably in the Pegmatite regions of North Carolina, in the Black Hills of South Dakota and in Alaska, so far nothing of promise has been found.

Tungsten

In 1939 the United States produced 3,900 metric tons of 60 percent WO_3 concentrates; its consumption is around 4,750 metric tons. The world production for the same period is believed to be around 40,000 tons.

There are hundreds of known tungsten deposits in the United States with the most important deposits situated in California, Colorado and Nevada. New discoveries are constantly being reported and it is conceivable that with sufficiently high prices the United States will become self-sufficient. The principal source of tungsten in the world during the past 20 years has been China where costs are low in peace time. There have, of course, been interruptions in shipments from this source in recent years. The tariff laws give the U. S. producer tariff protection to the extent of 50 cents per pound of metallic tungsten contained.

Mica, nickel, quartz crystal are not discussed here as they are not likely to be of interest to readers of this publication.

SPECIFICATION S. M.—8

1. *Grade* (*a*). There shall be three grades of manganese ore, suitable for the manufacture of standard ferro-manganese, Grade B. Federal Specification QQ-F-161, by the usual commercial methods of manufacture, conforming to the requirements as stated below:

(b) COMPOSITION ON A DRY BASIS

Grade	Manganese minimum	Iron maximum	Silica maximum	Phosphrous maximum	Alumina maximum	Zinc maximum
A	48%	7%	9%	0.12%	3%	1%
B	48%	*7%	†10%	0.18%	6%	1%
C	48%	7%	7%	0.15%	6%	1%

* Grade B iron content to be not less than 1 percent.

† For each additional percent of manganese content over 48 percent an additional 0.2 percent silica content allowable.

(*c*) Preferably, all ores should pass a 4-in. screen and contain a minimum of fines; however, no ore will be accepted which will not pass a 6-in. screen, nor which contains more than 12½ percent of fines which will pass a 20-mesh screen.

Critical Minerals

Aluminum

While this has not been specifically defined, it presumably includes bauxite which is the chief source of aluminum metal. It is mentioned here only to clarify that point. While some bauxite is used in the manufacture of refractories and other materials, its strategic value lies chiefly in its use as ore of aluminum. Its utilization involves very large investment in reduction plants.

Asbestos

The chief source of asbestos for United States consumption is Canada. Adequate supplies are readily available at present from Canadian deposits, the only asbestos being purchased for Government stockpile purposes being certain grades of amosite and Blue asbestos mined in South Africa.

There are many occurrences of asbestos in the United States, particularly on the Pacific Coast, but only a few of these could produce a character of fibre similar to that obtained from Canada. There are small mines in Arizona which also produce a limited amount of high grade "crude."

Asbestos is not subject to protective tariff.

Graphite

Graphite was mined in various parts of the country. During the World War a number of mills were built in Alabama. The production of Ceylon and Madagascar have been most important sources for many years. Domestic graphite and artificial graphite manufactured in the electric furnace could, if necessary, possibly supply domestic requirements.

Platinum

The principal source of this material at present is Canada which for some years has supplanted Russia as the chief source for United States needs. Dredging operations in Alaska also now supply substantial amounts. The situation is not regarded as sufficiently critical at present to compel the Government to make purchases for stockpile purposes at present.

Vanadium

This element is normally produced in four countries: Peru, Northern Rhodesia, Southwest Africa and the United States. In 1938 domestic production of various types of ore yielded 1,613,155 pounds of vanadium, an increase of 60 percent over 1937. Imports have also been increasing, amounting in 1938 to 1,384,320 pounds. The United States is the largest producer in the world at present. With increasing production in Utah and Colorado, it seems probable that the United States may become less dependent on imports.

Vanadium ores are usually too low grade to be imported and the existing tariff covers vanadium compounds, the excise amounting to around 25 to 40 percent ad valorem.

"Strategic" and "Critical" Not Fixed Classification

The discovery of new deposits, improved methods of beneficiation or the development of substitutes may bring about changes reducing classification of these minerals from "strategic" to "critical" or removing them altogether from both of these lists.

In the World War, for example, the list would have included molybdenum, potash and magnesite. Since that time the United States has become substantially self-sufficient in these minerals.

On the other hand it is possible that new demands, the exhaustion of known deposits or the fortunes of war might shift some critical minerals to the strategic list or even add certain items not heretofore included. If the United States were deprived of asbestos, nickel and platinum from Canada, the problem of finding other supplies would certainly become serious.

Interruption of imports of chromite and manganese, and possibly some other materials, and an approaching exhaustion of stocks in consumers hands and from the Government stockpile, would necessitate revision in purchase specifications of these minerals. Fortunately stocks in consumers hands are quite large. At the present rate of steel operation, unprecedented amounts are being consumed. In some cases imports have fallen far below the rate of consumption.

Domestic producers and potential producers are advised to be watchful of such possible changes.

War Minerals Relief

Following the collapse of markets at the close of the World War in 1918, Congress appropriated funds to compensate those who stood to lose their investments in war mineral enterprises, in cases where such operations had been urged by Government agents. After 20 years some of these claims are still in controversy.

The outcome was generally unsatisfactory to both claimants and the Government, and it seems certain that officials in Washington charged with assisting in the search for domestic supplies will make every effort to prevent a recurrence of Government responsibility of this kind.

The extension of loans by the R. F. C. for development and operation, and the payment by the Treasury of increased prices for domestic output and other factors described herein, should be recognized as measures to replace the former principle of postwar indemnity for losses.

Commandeering of Supplies and Mines

In case of war it seems probable that the Government will be given the power to commandeer existing stocks if it is deemed necessary.

Legislation may also be enacted to permit the Government to seize mines that are considered essential to the national defense. Such seizure would presumably be made of mines, the owners of which have been unable or unwilling to operate them adequately.

Technical Character of Small Operations

Small irregular deposits of these minerals are better suited to small groups than to "company" operation.

In the case of lessee or small operator, overhead costs are low and it is easy to "rawhide" where circumstances require.

If, however, development results in a sizeable operation, possibly requiring milling facilities, the "one man" or "small group" operation will usually find itself at a disadvantage due to the need of experienced management and high grade technical skill.

Considerable money may be needed to be spent in metallurgical testing, design and equipment. Mining operations require skilled planning; and development preceding production usually requires a substantial investment before orderly efficient production can commence. Ore deposits are seldom so simple in character that they can be developed and operated to the best advantage without the help of an ecomonic geologist.

When the proposed operation has the aspect of substantial size and importance intending investors should make sure that experienced mine management and technical guidance are to be provided.

It is assumed, of course, that the funds provided are to be adequate for the purpose. Estimates should be made by competent engineers. Those made by promoters are often lacking in detail and are usually underestimates. Even where care is used, unexpected costs usually occur, and many enterprises have failed because inadequately planned and insufficiently financed in the beginning. It is often extremely difficult to find money after original estimates have failed, for it is not easy to provide convincing excuses for such failures.

Decisions regarding operating problems and the selection of equipment are sometimes made by company officials who have had no previous experience in these matters, instead of relying on skilled advisors. Inexperienced operators tempted to make unadvised technical decisions would do well to explore the fate of others who have followed that procedure. It has been one of the principal reasons for failure of small or moderate sized operations.

Mills designed to utilize second-hand equipment because it happens to be available, without regard to its metallurgical suitability, usually invite disaster.

Emphasis has been placed on these matters here as the opening of new enterprises in this field is likely to attract investors who have had no previous experience in mining.

A 2-pipe mercury retort, Bottle Creek, Nevada

The Excess Profits Tax

● *Mining Congress Committee Points Out Important Amendments Needed Before Tax Returns Are Due*

THE Excess Profits Tax Act of 1940 was passed by Congress under heavy pressure and it is not surprising that it should contain many provisions which are extremely complex and difficult to administer. The more study that is given to this tax, the more the conviction arises that there are various points which call for definite amendment before the time comes for filing tax returns.

Consideration of this subject by the Executive Tax Committee of The American Mining Congress brings out a number of specific amendments, some of a more or less technical nature, which should have early consideration by the incoming Congress. Some of the more important of these may be outlined as follows:

(1) Daily computations of invested capital (which include daily computations of the *adjusted* basis of all admissible and inadmissible assets) are impossible, and should not be required.

(2) The credit based upon income of prior years should be retained, and all discriminations against its use should be removed. The credit should be based upon an average of any three of the four years in the base period, as proposed in the Pittman amendment adopted by the Senate; and "closed" years in the base period should not be "reopened."

(3) An election at the time of filing the tax return, between the credit based on income of prior years and the credit based on invested capital, should not be required; and the benefit of either credit, whichever produces the lesser tax, should be given.

(4) The rates of tax should be imposed on the *percentage* of excess profits over normal profits, as proposed in the bill as it passed the Senate, rather than upon *the dollar amounts* of excess profits as in the law as finally enacted.

(5) Simple devices should be adopted so that *true excess* profits will be measured over at least a five-year period. The unused excess profits credit should be extended so as to apply to all corporations rather than only to those corporations having a normal tax net income of less than $25,000, and both a "carry-over" and a "carry-back" should be permitted. The excess of "long-term" capital losses over "long-term" capital gains should be deductible in computing net income subject to the excess profits tax; and the "net loss" carry-over of the present law, which would then include the excess "long-term" capital losses, should be extended, at least for excess profits tax purposes, to five years.

(6) Adequate and fair provisions for special relief in unusual situations (a report on which is to be submitted to the Congress early in January by the Treasury and the staff of the Joint Committee) should be substituted for the present (admittedly tentative) provisions of section 722. Adjustments should be permitted for (a) abnormally low income in the base period, (b) abnormally low invested capital, and (c) abnormally high income in the taxable year. The statute should provide an immediate review by the Board of Tax Appeals of all decisions of the Commissioner with respect to applications for special relief, without awaiting audit of the return and whether or not a deficiency might eventually be determined.

(7) Section 723, which prescribes a substitute for "equity invested capital" in all cases where "the Commissioner determines that the equity invested capital . . . cannot be determined in accordance with section 718" should be properly safeguarded, so as to prevent arbitrary action. Section 721, however, which relates to the allocation of certain types of income earned over a period of years, seems adequate in its present form (although its effect and application cannot be determined until after the regulations thereunder are promulgated), and should be retained.

(8) Supplement A of Part II of the Act, which relates to the computation of base period net income in the case of certain mergers, consolidations, exchanges, liquidations, etc., should be completely revised so that the effect thereof will be properly reflected in the computations of the taxpayer's average base period net income.

(9) Section 751 of Supplement B of Part II of the Act, which prescribes the computation of invested capital in the case of certain mergers, consolidations and exchanges, should be revised so that the resulting increase in the invested capital of the transferee and the resulting decrease in the invested capital of the transferor will reflect the extent to which the transferor has been absorbed by the transferee; and the section should apply only where a 50 per cent interest or control remains in the transferor or its stockholders.

It would probably be impossible to re-write the entire Excess Profits Tax Act prior to March 15. Changes such as the above, however, would do much to eliminate some of the outstanding discriminations and inequities in the present law.

Marketing Agencies

(*Continued from page* 31)

ference from regulation, an ample car supply and its employees must be permitted to stay at their jobs.

The election is over and, no matter what our views were before, we are one great nation and if we expect to remain so and retain our liberty it behooves us all, whatever our political beliefs, or whatever our station in life, to support our nation. This means that we should express ourselves when necessary. A strong and vocal minority is one of our safeguards.

National Defense, to be what the term implies, must include defense against aggression from beyond our shores and defense against those elements in our own country that would destroy our liberty; these forces may be either intentionally subversive or may come from misguided or uninformed people.

It is our duty to express ourselves freely to those who represent us in the state legislature and in the National Congress, so that in the words of Abraham Lincoln:

". . . this nation, under God, shall have a new birth of freedom—and that the government of the people, by the people, for the people, shall not perish from the earth."

New T. C. I. Iron Ore Plant

A new central ore conditioning and sintering plant has been built near the Wenonah No. 7 iron mine, near Birmingham, Ala., in the Red Mountain iron ore district. The plant will serve the Tennessee Coal, Iron & Railroad Company iron mines of the territory.

Administering the WAGE-HOUR ACT

By COLONEL PHILIP B. FLEMING
Administrator, Wage and Hour Division
U. S. Department of Labor

CONGRESS recognized that American industry is diverse and that flexibility is essential in the administration of any law designed to apply to all of it in interstate commerce. I feel that Congress provided rather generously for such necessary flexibility in the Wage and Hour Law, and while all of it is not available to your industry, some of it is.

Cites Flexibility of Law as it Applies to Mining

For example, provision was made for the employment of learners, apprentices and handicapped workers at wages less than the minimum. A method was devised for the partial relaxation of the hours requirements in industries found to be seasonal, and this relaxation has been applied to certain gold placer operations. Certain industries are wholly exempt from the hours provisions or from both the minimum wage and maximum hours. Certain occupations were exempted from both the wage and hour provisions—such as those of executives, professional workers and outside salesmen. Provision was made whereby partial relaxation from the hours requirements may be obtained under certain types of collective bargaining agreements. This should be of considerable interest to the mining industry. Finally, the hours standards are not hard and fast limitations. Employes can be worked any number of hours a week, provided only that time and a half is paid for work in excess of the statutory maximum.

Problems of Metal Mining Difficult and Complicated

I am under the impression that no other industry has presented more complicated problems of compliance to us than metal mining. Almost daily we receive a letter or telegram from somebody in the industry asking for an opinion, or an interpretation, or suggesting some arrangement of hours and wages which he wants us to approve as meeting the requirements of the Act.

One might conclude from this mass of correspondence either that metal mining doesn't want to comply with the law and is looking for a loophole, or that the nature of the industry is such that compliance is more troublesome than in other industries. Let me say at once that I entertain no suspicion that the former may be the correct explanation. I know too many people in metal mining to believe for a moment that the vast majority of the employers are trying to avoid compliance. The very fact that so many of you have written to us in itself is rather conclusive evidence that this matter weighs upon your conscience. If you had not wanted to comply you wouldn't have taken the trouble to tell us your troubles; you would simply have gone along in the old way and waited until we caught you.

No, I think the real explanation is that the industry really is different. In all the country there is no other quite like metal mining.

Problems Arise From Nature of Mining Industry

A part of your difficulty and ours arises from the very nature of the mining industry itself. It is carried on under many varying conditions of climate and geography. There are low grade mines and high grade mines. There are mines operating near large and populous cities, and mines back in the mountains apart from the main currents of American life. To apply to all of them a single standard of labor conditions is admittedly difficult.

But part of the difficulty, I think, is also due to psychological factors and to custom and tradition. Mining in this country always has been a hazardous undertaking, not only for labor but for capital, too. A good deal of it is carried on in small camps isolated from the rest of the world and in which the manners and customs and values associated with living in populous communities do not seem to apply. An industry which has found it necessary to develop its own disciplines would naturally find it difficult to accept regulation imposed from without.

Only in a few exceptional instances are you having trouble about meeting the minimum wage requirements of the Act. Wages in metal mining generally are far in excess of the present 30-cents-an-hour minimum of the statute. Your problems are related almost solely to time-and-a-half for overtime.

The contention with which we most frequently are confronted is that, especially in many of the small, low grade mines, you find it difficult to pay time and a half for hours worked beyond 42 a week and still meet your operating costs, to say nothing of making a profit.

Spread the Work Device

It was the intention of Congress, by putting a penalty upon overtime work, to encourage the employment of additional labor. It was a spread-the-work device. It was assumed that imposition of the overtime penalty would encourage employers to eliminate overtime and employ extra workers. But here we meet the contention that this objective is not possible in metal mining because of the difficulty encountered in staggering shifts or in developing a swing-shift operation so that the mine can operate on a six-or-seven-shift per week basis. The difficulty of providing additional housing for more employes is put forth as a vital factor. Besides, much of the underground work is highly skilled and can be done effectively only by one worker or one group of workers. It would be dangerous to attempt to solve the overtime problem by sending into the mines men who are unfamiliar with the customary techniques and the lay-out of the mine shaft. Not only is it pro-

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hibitive to pay time and a half for work in excess of 42 hours a week in many cases, but we have been told that the men themselves don't want a 42-hour week. Many of them are living in remote mining camps and they would much rather put in long hours while at work and save up until they can take time off to go to town.

I should hesitate to attempt to furnish an off-hand solution to every problem that has been presented to us, but I want to list some of the principal ones as a basis, at least, for further discussion.

1. Must the time spent by the underground worker in traveling from the portal to the face be counted as time worked?

2. Must time spent at lunch underground be considered as time worked?

3. What is the status of the lessee miner, or the lessor? Is he an employe of the mine owner or really a lessee? Must he and his helpers, whom he employs and pays, be paid time and a half for overtime?

4. What deductions from wages will be considered by the Administrator to be reasonable?

5. Will the operator be protected from liability if he reduces the hourly rate to avoid the payment of overtime?

6. How about the construction employe—the carpenter who produces no goods for commerce, but merely builds new bunk houses, or a drying room, or a recreation hall? Is he covered by the law and must he be paid time and a half for overtime?

We cannot predict in advance just what the courts are going to say in respect to every problem that arises. The best we can do is to tell you what, in our opinion, the law means, and what, as to any particular problem, the courts have held in the past in analogous, or somewhat similar, circumstances. The case of the Cornucopia Gold Mine Corporation, however, may be worth citing, because it involved many of the questions which have been raised by other mine operators.

Cites Cornucopia Case

The Cornucopia Corporation owns and operates a mining property near Cornucopia, Oreg. There is no railroad nearer than 27 miles, and the largest "big town" is Baker, Oreg., which has a population of around 8,000 and is 75 miles away. This certainly may be considered an isolated mining property. The company was organized in 1930 and it is operating mines which previously had been worked but abandoned. The company did not commence operations until 1936. It lost money that year and also in 1937, but made a profit of about $122,000 in 1938, and, at the time of our investigation, it was estimated that about the same amount of profit would be made in 1939. Our inspector commented that "the officers and directors appear to be responsible individuals engaged in a legitimate enterprise."

The violations of the law which were reported upon inspection were all related either to overtime or the record-keeping requirements.

About October 24, 1938, when the Wage and Hour Law became effective, the company placed all of its employes on an hourly basis, although before that they had been on an eight-hour shift arrangement. The employes worked 48 hours one week and 56 the next, alternately. However, the new hourly rate was so arranged as to provide approximately the same income as before, and if the exact amount was not arrived at by these calculations, then an arbitrary adjustment was made in some instances to bring the wage up to a sum equivalent to the income as it would have been if figured at the regular daily wage. The question here was, what was the regular rate of pay and did the company pay one and a half the regular rate for overtime since the law became effective? We reached the conclusion that the regular rate of pay was not changed and that, hence, nothing extra was paid for the overtime as required by law.

Portal-to-Portal Question

This pay plan was in effect for 91 surface workers until September 19, 1939, but for the 97 underground workers a new system was devised November 15, 1938. This new system provided that the underground miners would continue to work the same shifts as before the Act became effective. There were two shifts a day and the miners went underground either at 7 a. m. and came out at 3:30 p. m., or in at 7 p. m. and out at 3:30 the following morning. This shift arrangement constituted a total of eight and a half hours spent underground, of which 30 minutes was deducted as a lunch period, leaving a net of eight hours worked per shift. For this the men were paid a set shift wage of $3.50, $4, or $4.50 a day. But the new system provided that the employes show only six hours per shift on their time cards, which they kept themselves and turned in each day. The company then reestablished the old shift rates. There could be no overtime because the most that could be worked, even for seven shifts a week, was 42 hours. The company's theory was that this was a proper keeping of time because it was maintained that two hours were consumed in traveling through the tunnel of the mine to the place where the miner actually worked. In other words, time spent in traveling from portal to face and from face to portal was not considered by the company to be time worked. It is interesting to note that while the company recorded that each man spent exactly two hours a day traveling underground, our own investigation showed that no miner actually spent more than 90 minutes daily in underground travel, and that some spent no more than 20 minutes. But, in any event, the question here was whether the time consumed from portal to portal, or only the time actually spent at the face, was to be considered time worked. Our own contention was that time consumed from portal to portal was hours worked, and that for these men the company had failed to pay extra for overtime and had failed to enter on its records the time actually worked.

Status of Lessees

The company insisted that only 188 employes were directly employed and that 87 were either lessees (or lessors) or employes of lessors, for whom the company was not responsible. We believed that these lessors and their helpers were bona fide employes of the company and had a right to look to it for compensation for their overtime. The normal incidents of the employer-employe relationship existed even though the company called the workmen "lessees."

In regard to this question of the status of lessees under the Wage and Hour Law, I announced in July a determination made at the request of metal mine operators and lessees of such operators in the intermountain states. I stated that each case must be determined on its particular facts, with primary importance given to the terms of each individual lease agreement and the method of operation under such agreement. If under the lease agreement control and supervision over the operations of the so-called lessee are reserved to the lessor, such lease agreement embodies the normal incidents of the employer-employe relationship and the so-called lessees will be considered as employes under the Fair Labor Standards Act.

On the other hand, if a particular

U. S. Department of Labor, Washington, D. C.

lessee is operating mining property which is not a part of the property currently being operated by the mining company with regular employes, and if in the lease agreement the mining company does not have the right to control the lessee in his operation of the mining property, it may well be that the lessee is not an employe of the mine owner but is in fact an independent operator of such property. However, I pointed out that if such lessee has his own employes who assist in the operation of the leased mine, such employes must be paid in accordance with the Fair Labor Standards Act if the products of the mine move in interstate commerce. In the ordinary case the mine owner retains title to the ore mined by the lessee and his employes and ships the product of the leased mine, along with his own, in interstate commerce. Therefore, if the lessee does not pay his own employes in accordance with the requirements of the Fair Labor Standards Act, Section 15 (a) (1) (the so-called "hot goods" section) prohibits the mine owner from shipping the product of the leased mine in interstate commerce.

Two courts recently have held lessees of mining property to be employes of the mine owner. One of the cases was decided by the Supreme Court of Utah under the Utah Unemployment Compensation Act, designated as "*National Tunnel and Mines Company* v. *Industrial Commission of Utah.*" The other decision was under the Fair Labor Standards Act and was rendered by a Federal judge in Oregon as a result of the proceedings instituted by the Division against this same Cornucopia Company. In both cases the mining company exercised complete control over the operations performed by the lessees.

In the Cornucopia case there were 34 employes whom the company claimed were not subject to the Act on the ground that they were employed in constructing a dry room, a recreation room and company houses, which employment it held was neither interstate commerce nor the production of goods for interstate commerce. Our attorneys believe that repairs or alterations to existing structures used in the production of goods for interstate commerce are covered by the Act, whereas the construction of entirely new structures may be exempt. The employes engaged exclusively on new construction work were held not to be covered by the law but the employes who were spending part of their time in this work and part in employment clearly subject to the Act were held to be covered.

These were the matters which comprised the substance of our case against the Cornucopia Gold Mines, and these were the practices which the court enjoined the company from continuing. The court directed the payment of approximately $13,000 in restitution to some 283 employes. I might add that this was a consent decree, and that the company did not challenge the validity of our interpretations and conclusions.

Working Time Computation Based on Custom

The portal-to-portal matter also has been presented to us by the bituminous coal mining industry. In response to inquiry I said that the Wage and Hour Division, in carrying out its enforcement duties in that industry, will accord great weight to any reasonable standards for determining working time which represent the prevailing customs and practices in the industry and are supported by a long history of *bona fide* collective bargaining agreements. In view of the circumstances described by the industry in submitting its inquiry, I announced that the practice of computing working time on a "face-to-face" basis in bituminous coal mining would not be unreasonable. The term "face-to-face" was explained to mean the productive work performed after the miner arrives at his usual working place, excluding the time spent in traveling from the portal or entrance of the mine to the place of work, and the time spent in returning from the working place to the portal at the end of the shift. This determination in the bituminous coal mining industry

should not be considered to apply to any mining operations where the traditional practice of computing hours worked differs from the custom in bituminous coal mining. In the Cornucopia case, for example, custom and tradition had long recognized the portal-to-portal basis of reckoning time worked.

Deductions from Wages

We are not yet disposed to take any particular position as to whether the half hour spent eating lunch underground may be deducted from hours worked. The problem is a very difficult one because the employe is required to eat under very unfavorable conditions and is subject to many of the hazards of his job while eating. On the other hand, we recognize that the employe does have time off in order to have lunch and an argument can be made that such time need not be considered as hours worked. But, as I say, the Division is not prepared at the present time to make any definitive determination on this question.

Deductions from wages are a recurring source of irritation, but the problem seems to be more acute in coal mining than in metal mining. The law, as you know, defines the wage paid to the employe to include the reasonable cost to the employer, as determined by the Administrator, of furnishing such employe with board, lodging, or other facilities, if such board, lodging, or other facilities are customarily furnished by such employer to his employes. Our regulations on the subject state that "reasonable cost" shall not include a profit to the employer, and that the cost of facilities, such as tools, furnished to the employe not for his benefit but for the employer's, may not be deducted from wages, if such deduction "cuts into" the minimum wage or compensation for overtime. An example of deductions which we could not wholly approve was reported by one of our inspectors in Pennsylvania. A coal miner, who had worked 77 hours in a two-week period for which his earnings were $79.79, was charged 77 cents for lamps, 52 cents for smithing, $3.55 for powder, 75 cents for Social Security taxes, $1.26 for the union check off, 55 cents for bath, $1.50 for hospital dues, $1.50 for medical service, $60.09 for his account at the store, $8.10 for rent, 20 cents for the baseball fund—a total deduction of $78.79, leaving exactly $1 in cash in his envelope. In this case we disallowed the charges for lamps, smithing and powder and that proportion of the store account that represented a profit to the employer. But so long as such non-deductible items do not "cut into" the minimum wage of 30 cents an hour and no question of overtime is involved, there is no violation of the Act.

Overtime Payments

Will the operator be protected from liability if he manipulates the hourly rate to avoid the payment of overtime? A rather familiar example of this particular device is illustrated by the case of the employer who, at the time the Act became effective, was paying his employes $4.50 for a normal work day of eight hours. A normal workweek consisted of seven workdays. Thus, the employes earned $31.50 for a workweek of 56 hours. But the employer calls his employes together and makes a little speech. He tells them that it is necessary for him to pay them on an hourly rate. He has decided, he says, to pay them 50 cents an hour for the first six hours of each workday, and 75 cents (time and a half 50 cents) for the seventh and eighth hours. He asks them to agree to this new wage schedule. Since the plan means no change whatever in either hours or total earnings, the employes may accept it. The difficulty with this little scheme, however, is that it is a mere subterfuge.

The division of a normal 8-hour day into six "straight time" hours and two "overtime" hours is purely fictitious. The employe is not actually being paid at the rate of 50 cents an hour and the alleged overtime rate of 75 cents is not paid for overtime work. He is simply getting, as he always got, $4.50 for an 8-hour day and his regular rate of pay continues to be 56 cents an hour.

This employer does not comply with section 7 of the Act unless he pays his employes 84 cents an hour (time and one half 56 cents) for each hour they work in excess of 42 hours a week, or a total of $35.28 for a 56-hour week.

That this is so becomes apparent when one stops to reflect about the purpose of the law. The Act is not intended to force employers to pay more money to their employes who work overtime. The Act seeks to induce employers to reduce hours by making overtime work more costly. Thus, if an employer reduced the hours worked by his employes from 56 to 52 or less during the first year of the law, to 51⅓ or less during the second year, and to 50⅔ hours or less after this coming October 24, he could continue to pay $31.50 a week, the salary he paid for a 56-hour week prior to the Act, and still be in strict compliance. It can hardly be said that a law which, in the case we have supposed, requires a reduction of four hours a week during the first year of its existence, an additional 40 minutes a week during the second year and another reduction of 40 minutes thereafter is seriously burdensome.

Adjustments Made By Mine Operators to Meet Hours Requirements

In general, mine operators have attempted to meet the hours requirements of the Wage and Hour Law by one or another of three types of adjustments: They have reduced the number of shifts to five a week of eight hours each; or they have shortened the shift to approximately seven hours; or they are paying the overtime above 42 hours a week. When the 40-hour provision becomes effective in October it will require the payment of overtime or the cutting of shifts to five a week, at some increase in labor costs, unless this is compensated for by the greater productivity of the workers, as has been the experience of at least one large mine studied by our economists.

Mine operators frequently assure us that their employes are not in sympathy with the maximum week provisions, that they would much rather work 56 or even 70 hours a week at straight time than run the risk of having their total earnings reduced because of the reluctance of employers to pay for overtime. I certainly do not question the good faith of those mine owners and managers who give us this assurance, but the weight of the evidence which comes to us from the miners through their own spokesmen is on the other side. The International Union of Mine, Mill and Smelter Workers indorses the Act, including its present overtime provisions, and we have received many letters from individual miners to the same effect. Several months ago a representative of the Wage and Hour Division made extensive inquiries in Montana and while he was told that some miners were anxious to put in long hours at straight time, he says he did not himself succeed in meeting any of them. The fellow who enjoyed working overtime without extra compensation was pretty illusive. He was always over in the next county or in some other part of the state.

In the course of his report this Division representative wrote (and I quote):

"I found an interesting situation in Butte. When the Wage and Hour Act first went into effect the Anaconda Company made a 40-hour week immediately effective. The miners formerly were worked 48. The change resulted in the loss of a day's pay each week, but it also resulted in the employment of about 800 additional miners. Considerable agitation was caused by the change, and the miners' pay was so materially reduced that there was a great deal of dissension. However, a wage and hour committee was appointed representing all the unions in the Butte area, and numerous meetings and hearings were held. As a result of the agitation the Anaconda Company offered to return to the 48-hour week, and pay the miners time and a half for the hours in excess of 44. (This was before the 42-hour week became effective.) When this proposal was received it was submitted by the Wage and Hour Committee to all the unions in Butte, who took a vote on it. The Teamsters' Union voted in favor of the 48-hour week, but all the other unions in Butte voted conclusively against it, and the vote of the miners' union was almost unanimously in favor of the 40-hour week. Butte furnishes an excellent illustration of one place where the Act succeeded in spreading employment in an effective way.

"Because of the statements made to me by miners who are themselves in favor of the 40-hour week, I would give full credence to their estimate indicating that some 10 or 15 percent of the miners in the isolated mines would favor a longer day. It is significant, however, that in my trip around the state I could not find a single miner who favored it. I believe, however, that when investigations are made it will be found that many violations of the Wage and Hour Law now exist in the isolated mining districts where miners are found employed under many types of contracts. This will be found to be true, I believe, not because of any desire to violate the law, but because, as a matter of custom and convenience, miners in the small camps have been accustomed to work in a haphazard fashion."

I trust I have been able to show you that we are fully aware of most of the problems that perplex you under the Wage and Hour Law. I regret that I am not able on the spur of the moment to produce a sure-fire, litigation-proof answer to every question that you may be able to ask. I do not think anybody can do that. Some of those questions can be answered finally only by the courts.

It would be pleasant too, if I could show each of you how you can comply with the law without it costing you a single cent. But I can't do that, either. I don't think Congress expected that you were going to be able to comply without it costing you something. The Wage and Hour Law is social legislation in the broad sense, and like most other good things the attainment of its objectives involves some sacrifice to somebody. It was expected, however, that, though some employers might have to pay more for labor, they, in common with the rest of us, would benefit in the long run from increased mass buying power, better national health, and the greater contentment of workers. These benefits we are now beginning to enjoy.

I think it fair to point out, too, that the price of metals generally has been rising for the last two years. The impetus given to business by the great national defense program, in which metals of all sorts are vitally needed, will be especially to the advantage of mine operators. I might also say that your government for some years, due to its monetary policies, has been subsidizing gold and silver mine owners. Indeed, but for these subsidies, many mines that are operating today and producing rather handsome profits would still be closed.

No Relaxation of Overtime Provisions

Some have felt that the war and our necessity for building up the national defense have so radically changed the industrial situation in this country that we shall have to relax the hours requirements of the Wage and Hour Law. The argument runs that while there is an admitted oversupply of idle labor willing and anxious to go to work, there is an acute shortage of skilled labor and that we must permit the skilled labor already on the job to work overtime without paying time and a half for the overtime.

I have discussed this matter several times recently and I do not want to prolong these remarks unduly by undertaking an extensive treatment of it here. Perhaps it will suffice to repeat that in my opinion no relaxation of the overtime provisions of the Act at this time is either necessary or desirable.

I feel that the principle of a floor under wages and a ceiling over hours is here to stay. I suggest, therefore, the fullest cooperation among industry, labor and the Division to bring about the achievement of its purpose.

— *Discussion* —

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WE recognize in Colonel Fleming a man who wants to do his job well, to administer the act under which he operates fairly, without self-advertisement, without preconceived ideas on capital and labor, and without the slightest desire to crusade for any particular economic theory. I only wish that Congress had given him a better act to administer.

Colonel Fleming is an artillery officer, and he has to fire the gun that Congress gave him. It is just too bad that that gun, which is properly aimed at sweatshop conditions, has turned out to be a scatter-gun which hits practically every miner at this convention, and many of his employes as well.

I may say at the outset that I am not one of those who want to "repeal the whole damn thing." I certainly believe in the minimum wage feature of the act. Twelve dollars a week for 40 hours work is, to my mind, none too much for any man, except a messenger in a lawyer's office. I was one once, and at $35 a month, and I know I wasn't worth it. But, seriously speaking, I do not believe that we in California would have any objection to having the 40 cents an hour scale, which is the ultimate objective of the act, go into force at once. I know of no mine in Cali-

Edgar T. Zook

fornia which now pays as little as $3.20 a day to its employes.

Overtime Provisions Unsound

But the point I wish to make is that, in its overtime provisions, and its attempt to freeze into industry the wage scale of October 24, 1938, and to reduce all hours of labor to 40 a week, or as an alternative to compel an employer to pay time and one-half for all time over 40 hours, no matter what the base pay may be, the act is unsound, unfair, and intellectually dishonest.

The express purpose of the act is "To correct and eliminate the existence of labor conditions detrimental to the maintenance of the minimum standard of living necessary for health, efficiency, and general well-being of workers."

The law was passed ostensibly, and I use the word "ostensibly" advisedly, for that purpose. To that end it has declared that goods going into commerce which have a wage factor of 30 cents an hour for 40 hours, or $12 a week, are honest goods; and that where a man works 48 hours and gets $12 for the first 40 hours and $3.60 for the next 8 hours, a total of $13.60, the goods are honest goods; but Congress goes further and says that where goods are produced by labor which gets 50 cents an hour for 48 hours' work, or $24 a week, the goods are dishonest and are to be barred from interstate commerce. Furthermore, the man who pays his labor $15.60 a week for 48 hours' work is an honest employer and can walk down the street with his head erect and his chest out, but the man who pays his men $24 for the same number of hours worked per week is a criminal, at whom the finger of scorn may be pointed by every self-righteous man who believes in the shadow and disregards the substance.

The substance is that the health, efficiency, and general well-being of the so-called criminal employer's employes is just $8.50 better than that of the men who work for the employer who merely lives up to the strict letter of the law. I wonder which man likes his boss better—the man who gets $15.60 or the one who gets $24? Of course, the $24 man is better off, because he lives and eats and clothes himself on the dollars he gets, not on the compliance by his boss with an arithmetical formula.

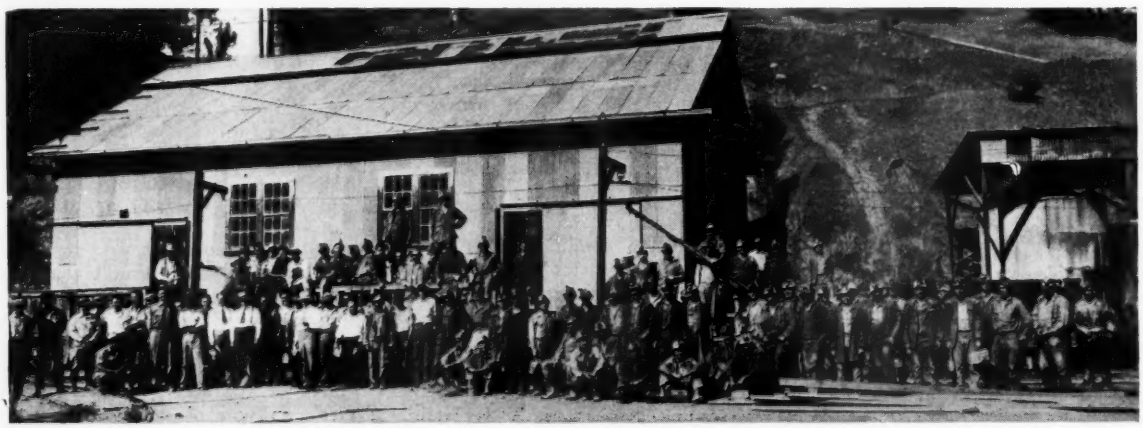
One might assume that Congress has determined that 40 hours a week is the proper number of hours to work; but that is not the fact. Congress has not said that working 48, or 56, or 70 hours a week is detrimental to the worker's well-being; for the law permits any number of hours, if the employe gets paid time and a half for the extra hours. If truly interested in the health factor, why didn't Congress declare that a certain number of hours are the maximum number a man should be permitted to work? (I pass over the constitutional power of Congress to make such a declaration, for what legislator bothers about the Constitution now?) I personally believe that 48 hours is probably a fair maximum in practically all instances, but Congress shows no interest in the health of the worker by establishing such a maximum, but is only concerned with his getting more money. In this respect, it has given us a typical example of William Graham Sumner's definition of a reform movement, which arises "when A and B get together to decide what C shall do for D."

I venture to disagree with the report of Colonel Fleming's subordinate that the man who wants to work over 40 hours a week is always in the next county. I know that there have been three or four generations of miners in the Grass Valley District who have worked 48 hours a week; and the grandsons and great-grandsons of the original miners are just as husky as their forbears, and are still willing and anxious to work 48 hours a week. In fact, the hoist men who used to work, or at least be on the job, seven days a week (for the actual work on Sundays was negligible) raised an awful rumpus when they were put on a six-day basis.

Act Says Nothing of Spreading the Work

It is said that Congress intended to spread the work by reducing the work week to 40 hours. I find nothing in the act about spreading the work, and I doubt if Congress thought it would add to its popularity to tell any laboring man that he was going to get his earning capacity reduced by one-sixth, as has happened in so many instances when, for economic reasons, the employer cannot afford to pay the overtime for a six-day week, and for practical reasons cannot employ additional help for the work which has ordinarily been done on the sixth day.

It may be that, with a thousand men on an assembly line in a factory, one could employ an additional 200 men each week and get the same production; but I know of no feasible method whereby you may spread the work by portioning out one-sixth of the working face in a mine; and if you have a small mill which has required two men for 48 hours a week, or 96 hours' work, for its economical



operation, and you can't afford to pay more wages, I don't know how you're going to put another man on without dividing the work into three 32-hour shifts, thereby giving no one a decent amount of work, unless you can get some man to work only 16 hours while the other two work 40 hours each. The necessary result has been that, by its rigid insistence on the overtime provision, Congress has done the opposite of what it intended to do; namely, to correct certain admitted evils "without substantially curtailing employment or earning power." I say that Congress has materially curtailed both by its overtime penalty.

The statement that the well-to-do and prosperous employer may work his men by paying the overtime penalty is a pretty poor consolation to the decent employer. If an enlightened employer has been paying 70 cents an hour, his penalty for compliance is to pay 35 cents extra for overtime, while the skinflint who has paid the bare minimum gets penalized only 15 cents an hour for overtime work. If that makes sense, some of us are crazy.

Suggests Amendments to Act

I suggest that we should work for an amendment to the act that would provide for a minimum for 40 hours' work, and possibly a slightly higher minimum wage for 48 hours, with no other overtime provisions, and then the vast majority of all industry, and particularly the mining industry, will be able to continue to pay wages far above the minimum necessary for the health, efficiency, and general well-being of its employes, without being unreasonably penalized by the attempt of Congress to write into law the fetish of time and a half for overtime.

And I hope that when we get this amendment, Colonel Fleming will continue to administer the act and that his subordinates will not have to spend so much of their time, as they have been doing lately, in the computation of formulae of arithmetic, algebra, and possibly calculus, to matters which have nothing to do with the real problem, which is: Do the employes get a decent living wage for a reasonable number of hours worked?

LAST year the American Mining Congress in its Declaration of Policy at the Salt Lake City meeting said of the Federal Wage-Hour Law:

"The Fair Labor Standards Act in its application to mining is impracticable and is destructive to the mining industry in many districts. We urge the repeal of this law.

"We believe that better employer-employe relations would result from a change in national policy based upon recognition of the fact that our country is too large, its industries too varied, conditions in the different states, sections and localities too diverse to permit of successful administration of any law placing control of such relations in federal agencies."

I see no reason to change that declaration. As our experiences accumulate, we are more and more impressed with the fact that our country is too large, its industries too varied and that conditions are too diverse for one general blanket law to fit all employers, all employes, all employments, all localities in all seasons. We in Alaska have had about the same experience as others have had.

It was recognized before the law was in operation three months that it could not be generally applied to all industries in the whole country without great difficulty and hardship and without, in many instances, defeating its very purpose. Amendments were proposed in Congress. These were urged by the House Committee on Labor, by heads of departments of the government at Washington, by the Wage-Hour Administrator, by employers and employes. They failed of passage not because of the weight of any objections to them, not because of opposition to them but because of a struggle in the House between the sponsors of the amendments and those who took the position that the amendments did not go far enough and who insisted that unless the law could be completely overhauled, they would leave it as it was and prevent any changes at all, with the thought that in time the entire country would see the impracticability of one national law on the subject of wages and hours and would see that the regulation of such things should be left to the states.

H. L. Faulkner

Multiplicity of Bulletins and Regulations Result of Present Law

The result of leaving the law as it was enacted, with all its defects, has been that the work of the Administrator has assumed great importance and a vast new bureau has sprung up, manned by an army of interpreters, investigators, field agents, counsel, assistant counsel and bulletin writers, etc. Seasonal exemptions have been granted wherever possible, and the Administrator has been confronted many times with the task of seeking by interpretation of the present law to do what should be done by amendment to the law itself. Mimeographing and multigraphing machines have been set going, and employers have been so flooded with interpretative bulletins, revised interpretative bulletins and supplemental and revised supplemental bulletins that an employer must spend more time and effort to know just where he stands with reference to this law than he is permitted to spend in the operation of his property and in the important engineering and administrative problems arising from day to day in connection with production.

He may digest and classify and tabulate and index all the numerous interpretations and regulations; he may know exactly today the provisions of Section 516.4 of the regulations as amended, but he does not know whether tomorrow a new bulletin may not arrive among 15 others which amends the amendment to section 516.4 of the regulations and places a new interpretation upon some of the law's provisions.

I know the answer to all this is that this is a new law and it will result in some confusion until we have had more experience with it, until we become accustomed to it; that it cannot be made as plain and clear at the outset as the law against petty larceny; that our society has become complex in this era of machinery and mechanical appliances and mass production and that it requires some complex regulations in the application of social reforms, but, granting this to be true, does it require quite so much complication and confusion?

Alaska Miners Back Repeal

I am sure I can speak for all employers in Alaska when I say that we adhere to the declaration of policy of this congress adopted last year to the effect that the Wage-Hour Law ought to be repealed. Our experience in Alaska has been that the labor unions

have abundantly demonstrated that they are able to regulate hours and wages through their organizations without the necessity of a wage-hour law and a multiplicity of interpretations of its provisions.

Illustrates Hardships Imposed by the Law

The two industries in our territory are mining and fishing, and both of these industries are pretty well organized. Fishing is not subject to the provisions of the Wage-Hour Law, but with the union scale of wages and the provisions for overtime payments, some of the largest packers of canned salmon in the territory have been obliged to suspend operations entirely this year. The packing of canned salmon is an industry from which the territory has always derived the greater part of its tax revenue and is an industry which has the largest payroll. Last year at two canneries alone of one company operating out of San Francisco the overtime wages paid to the cooks, stewards and waiters amounted to approximately $50,000. At one cannery three employes of the American Can Company arrived by airplane in the evening to repair a machine. They were given dinner at the messhouse at 9 o'clock at night. The next morning they came to the bookkeeper to pay the cost of their dinner. Under the union contract, it had been necessary to have a cook, assistant cook, waiter and dishwasher to serve the meal to the three men, and, since it was after hours, the men drew double time and the cost of the meal for the three men was $44.60.

At another cannery the superintendent, after midnight, went to the messhouse and, finding no one there, prepared himself a cup of coffee and a sandwich. The next morning the union representative presented him with a bill for $5.60, which represented the overtime to which the cook and his assistant would have been entitled had they been called to prepare the coffee and sandwich. The inevitable result of this was that the packers involved in these union contracts suspended all operations in 1940, and no operations were carried on in Bristol Bay out of San Francisco this season.

Need for Simple Law

It seems that there is no immediate prospect of repealing this law, so the next best thing is to have as plain and simple a law as possible and one that needs a minimum of interpretation by administrative officials. Our mails are loaded down with bulletins, notices of hearings, interpretations and regulations, and as is always the case with a law of this nature which is so unsatisfactory and impractical, and which requires such a large force for its interpretation alone, to say nothing of its enforcement, we get many absurd results. Let me illustrate what I mean.

Many scores of applications have been made to the Administrator for classification of industries as seasonal so as to exempt them from the provisions of subdivision b (3), Section 7, of the law. Last fall an application was made for an exemption of the Christmas tree industry as seasonal; that is, a classification of it as an industry which did not operate more than 14 weeks a year. This on its face would seem to be a very simple problem, but after the solution of that question, the next one was whether decorative greens should be included with Christmas trees. The solution of that question likewise appeared to be simple, but the next question did not appear so easy of solution, for it was: What should be included as decorative greens? There was no trouble with holly, mistletoe, laurel, hemlock, and many of the well-known shrubs, plants, and trees generally used to decorate Christmas trees, but what about such things as ruscus, statice, lycopodium, and lycothoe? They are also sometimes used as decorative greens, but when you turn the matter over to the appropriate board, subdivision, committee, or group of experts in this field they immediately discover that there are many different species of ruscus, statice, lycopodium, and lycothoe, and that in the case of lycothoe alone, which has 39 different species, only some of them are used as decorative greens and some are found only as fossils in the tertiary deposits of Europe and some in this country in the middle cretaceous of the Mezozoic era, so that great care must be exercised when passing upon the seasonal nature of the Christmas tree industry with decorative greens included, so as not to make a general exemption which might apply to an employer engaged in collecting fossilized specimens which might require to be shipped in interstate commerce to some museum of natural history.

So far as the mining industry in our territory is concerned, we find it difficult to adopt one blanket rule for a company like the Alaska-Juneau, with 1,000 employes operating within and adjoining a town of considerable size, where labor generally is plentiful, and the Chichagof company, operating on a remote island with a small crew doing only experimental work, probably at a loss to the owners, and it is difficult to apply the same rule for a company with 1,000 employes operating three regular shifts the year round and the placer mining industry of the interior where the seasons are short and advantage must be taken of every hour of sunshine and of the seasonal water supply. Practically the only mining in Alaska, outside of a little coal mining and a small amount of platinum production, is the gold mining. Some of it is on a very small margin. The price of gold is fixed, and the industry cannot go on forever absorbing higher costs, employing more men and bringing themselves to a point where the cost of production overtakes the value of the product.

Asks Fair Treatment for Mining

What I have said is not to be taken as a reflection on the men who are attempting to administer this law. We want to do the very best we can with them, and all we ask in return is reasonable and fair treatment. It is difficult at best to follow all the ramifications of the regulations and interpretations, but we are willing to do the best we can, and we want to be informed. Recently a man came to the territory representing the Wage-Hour Division. He visited one or two camps, and whether he found anything wrong with the system of operating, with the method of bookkeeping, with the computation of time and overtime, we do not know, for his only statement was that he was making a survey and would report what he found to the Administrator in Washington. We feel that if such inspectors and surveyors come to the territory and find anything wrong or have any suggestions to make, that they go directly to the employer and inform him. We feel that this is not asking too much. We know that the Administrator of this law has a difficult task to perform and that there has been imposed upon him the burden of making interpretations from day to day of a law which should in all fairness be clarified so that employers and employes do not need hundreds of regulations and scores of interpretations in order to know just where they stand, and in the meantime we feel that the American Mining Congress should continue its efforts for a repeal of the law and, if that cannot be accomplished, for the necessary amendments to simplify and clarify it.

WHEELS of Government

● *As Viewed by A. W. Dickinson of the American Mining Congress*

SWARMS of administration employes, granted time off from their work to participate in the homecoming, welcomed the President as he drove up Pennsylvania Avenue on a sunny November morning after the election.

No such welcome awaited the returning members of Congress from the President, who indicated complete indifference to their presence in Washington. In response to questioning at press conferences, he stated that he had no more legislation to send down for the present session. The majority leaders endeavored to guide the Congress into an adjournment but when the vote was taken on November 19, 44 Democrats voting with the Republicans defeated the motion by a vote of 191 to 148. This action of the House came as a surprise to the majority leaders, and the Senate and the House have now settled down to a procedure of watchful waiting which may not terminate until the new Congress convenes in January.

In the 77th Congress, which meets January 3, the House will have 267 Democrats, 162 Republicans, 3 Progressives, 1 Farmer-Labor, 1 American-Labor and 1 independent; in the present session this proportion is 260 Democrats, 167 Republicans, 2 Progressives, 1 Farmer-Labor and 1 American-Labor. In the new Senate are 66 Democrats, 28 Republicans, 1 Progressive, 1 independent. In the present session the roll carries 68 Democrats, 23 Republicans, 2 Farmer-Labor, 1 Progressive and 1 independent.

It now appears that there will be little of legislative enactment during the remainder of 1940. The Walter-Logan bill to curb the action of administrative agencies and the Smith amendment to the National Labor Relations Act have little chance of final enactment. The same belief applies generally to the pending stream pollution bill, the wage-hour amendments, the LaFollette oppressive labor practices bill and the Nealy mine inspection bill.

Again More Taxes

White House conversations including Senate and House leaders and representatives of the Treasury point to additional revenue levies early in the 77th Congress. There has been mention of various excise taxes, luxury taxes and increases in normal and corporation rates but up to the present these are all purely conjectural. Some clarification and revision of the 1940 excess profits tax is anticipated and this may be handled along with the general tax bill. The Treasury has expressed its desire to increase the public debt limit from the present $49,000,000,000 to $65,000,000,000.

Procedure under the amortization provision of the second Revenue Act of 1940 is now functioning. Defense facilities constructed or acquired after June 10, 1940, may be amortized over a period of five years by the procurement of a "Certificate of Necessity" approved by the National Defense Commission and the Secretary of War or Secretary of the Navy. If the contractor is being reimbursed by the Government for the cost of the new facilities, either directly or indirectly, at a rate higher than the normal rate of depreciation, a "Certificate of Government Protection" will be required stating that the Government is protected as to the future use and disposition of the facilities involved. Where the producer is not being reimbursed, a "Certificate of Non-Reimbursement" establishes for purposes of taxation that a "Certificate of Government Protection" is not required. These certifications are to be handled by the Assistant Secretary of War and the Judge Advocate General of the Navy.

Added to the Treasury ruling that salaries paid to employes absent on military service may be deducted from gross income, there is now a second ruling that where an employe in military service is paid the difference between his civilian pay and his army pay, this amount is not subject to Social Security taxes.

Peace Gestures on the NLRB

Closely following the national electin came the appointment of Dr. Harry A. Millis to the chairmanship of the National Labor Relations Board. An economist at Chicago University, Millis was a member of the original Labor Board and has been serving for some time as an arbitrator of disputes arising out of the contract between the General Motors Corporation and the Automobile Workers Union. It is generally felt that the views of Dr. Millis and Dr. William M. Leiserson, a present member of the board, are in agreement on labor relations matters. Several of the staff employes of the National Labor Relations Board have tendered their resignations and moved on to other pursuits with a resultant improvement in the atmosphere of that organization. Meanwhile the Smith amendments to the National Labor Relations Act have remained blocked in the Senate Committee on Education and Labor and the chances are slim that they will receive any further action this year.

An interesting Supreme Court decision of early November ruled against an NLRB order to the Republic Steel Corporation to turn over to "work relief agencies" a portion of the back pay of a number of reinstated employes. In making the back payments to its employes the corporation deducted the amounts received by them from the WPA and the board had directed that the WPA be reimbursed for such amounts. A lower Federal court had sustained the board in its order but Chief Justice Hughes declared "The Act is essentially remedial. It does not carry a penal program declaring the described unfair labor practices to be crimes. The Act does not prescribe penalties or fines in vindication of public rights or provide indemnities against community losses as distinguished from the protection and com-

pensation of employes." Although Justices Black and Douglas dissented, the Supreme Court by its ruling put an end to what bid fair to become a wholly unwarranted practice.

What Constitutes "Hours Worked"?

On November 1 the Wage-Hour Division announced that as the result of a conference between Administrator Fleming, President Reid Robinson of the International Union of Mine, Mill and Smelter Workers and a number of iron ore union representatives from the Birmingham district, fact-finding conferences would be held with relation to hours worked at metal mines. On November 29 it was announced that these conferences would be held in Salt Lake City, Utah, and Birmingham, Ala., about the middle of December, if possible, and it is known that Colonel Philip B. Fleming hopes to attend. The Wage-Hour Division has asked representatives of industry and labor to be prepared to testify on or to submit the following information:

(1) The longest, shortest and average time required to reach the working face from the portal of the mine.

(2) Means of transportation from portal to working face.

(3) Time spent in getting tools and in changing clothes.

(4) Customary practice with respect to payment for time spent from portal to working face and return.

(5) Union agreement and/or State laws governing the computation of working time.

(6) Fulltime spent at working face and an estimate of minimum time required for completing round of work.

(7) Any other information which it is desired to present and which has a bearing upon the problem.

Colonel Fleming has stated that any interpretation announced by him as a result of these conferences would be merely an informal interpretation which would guide him in his duties of enforcement under the Act. He also points out, however, that as the Supreme Court announced in the case of U. S. Free American Trucking Associations Inc. et al., 310 U. S. 534, the Administrator's interpretative opinions covering the Fair Labor Standards Act are entitled to great weight.

When the redefinitions of the terms "executive," "administrative," and "professional" employes were made public by the Wage-Hour Administration on October 14 a flood of inquiries, including many from labor groups, was received by the Wage-Hour Division. In response the Division made public the report of the examiner, Harold Stein, who heard the original testimony on the redefinitions, and in addition to this, Administrator Fleming addressed letters to some labor organizations in which he said in part:

"The new definition of the word 'executive' is based on the previous single definition of the two words 'executive-administrative.' In the earlier definition there was an exceedingly troublesome phrase 'who performs no substantial amount of work of the same nature as that performed by non-exempt employes.' This phrase was designed to keep within the coverage of the Act, working foremen and working supervisors. With one minor exception the phrase has been translated into numerical terms whereby 'no substantial amount of work' is defined as meaning not more than 20 percent. . . . There would be a basic error in describing as an 'executive' any person who is paid less than $30 a week. Furthermore, heretofore the exemption was applicable to hourly paid employes if their hourly pay was sufficiently high to produce $30 a week. This proviso has been changed and no hourly paid employe can qualify for the exemption."

The administrator said further: "The definition of 'administrative' does not permit the exemption, for example, of employes who perform manual tasks such as tool and die makers, no matter what they earn, nor of those whose work is purely routine, such as business machine operators, no matter what they earn, nor of any employe whose rate of pay is less than $200 per month. It is my considered judgment that with these significant limitations, employes who meet the requirements of the administrative definition are properly exempt from the wage and hour provisions of the Act . . . in certain instances in low-wage industries and areas there will be some employes not exempt who do not need the protection of the Act. But in a general way and with due regard for the nation-wide application of the Act and these regulations I feel that the definition is sound and fair."

Concerning bookkeepers, Colonel Fleming further stated "Over 90 percent of all bookkeepers are paid less than $200 a month and are thus automatically barred from exemption. There are, however, a few persons whose work includes bookkeeping who will be exempt. Characteristically the bookkeeper who is paid as much as $200 a month also serves as an office manager or performs other functions sufficiently important to justify the payment of what is a comparatively high salary. In these rare instances the bookkeeper-office manager, etc.,

The Union Station Plaza, Washington, D. C.

will meet all the requirements of the administrative definition." Of the professional employe, Colonel Fleming said: "His work must be intellectual and varied in character; it must require the exercise of discretion; it must be of a type whose output cannot be standardized; not more than 20 percent of the workweek can be devoted to non-exempt work; the employe must be paid not less than $200 per month; and finally, the work must fall within either one of the recognized, learned professions or one of the recognized artistic professions."

St. Lawrence Power Means Seaway Tool

The allotment by the President in October of one million dollars to the Corps of Engineers for surveys and investigations for the power project along the International Rapids section of the St. Lawrence River is now definitely known to apply to the proposed seaway as well. In a recent letter to Representative William A. Pittenger of Duluth, Minn., the President said, "The investigations which I have authorized are necessary preliminaries to the undertaking of the entire project in the International Rapids section of the St. Lawrence River, for both navigation and power. Development of power is the matter of immediate urgency from the national defense viewpoint but nothing in the steps which are now being taken will in any way delay or increase the cost of the deep waterway undertaking."

This at least clarifies the situation with which the industrial populations of the Great Lakes Basin now know they must cope.

Walter-Logan Bill Advanced

When the highly controversial Walter-Logan bill, to curb the undue exercise of power by administrative agencies, passed the Senate November 26 by a vote of 27 to 25, Majority Leader Barkley of Kentucky stated publicly that he would ask the President to exercise his veto power on the measure, and it has been currently reported that the President is prepared to veto this bill.

The Walter-Logan bill provides that rules and regulations issued by administrative agencies affecting the rights of persons or property may not become effective until they have been published in the *Federal Register*. Where persons are affected by rules previously issued, they may petition and secure modification or withdrawal. On petition, the Federal Court of Appeals for the District of Columbia may determine whether the published rules and regulations conform with the Constitution and the Federal statutes and may declare a contested rule valid or invalid.

The bill would also establish boards within the various Federal agencies to hear the complaints of aggrieved persons with authority to approve, disapprove or modify a decision or ruling within the agency affected. If delay incident to the hearing and decision results in pecuniary damage to the aggrieved person the board shall certify the amount to Congress for a compensating appropriation. Any party to a proceeding before any agency who may be aggrieved by the final decision or order is further authorized to petition the Federal Courts of Appeals, which may affirm or set aside the decision or direct the agency to modify it.

Agencies exempt from the provisions of the Walter-Logan bill are the Interstate Commerce Commission, Civil Service Commission, Federal Trade Commission, Railroad Retirement Board, all Federal lending agencies, War and Navy Departments, Defense Commission, Office of Comptroller of the Currency and the State and Justice Departments.

Essential as Well as Strategic Metals

While carrying on with its strategic minerals work the Defense Commission has also been devoting studies in recent weeks to the situation in copper and zinc, which are classed as "essential" commodities.

Estimated United States demand for copper in 1941 is 1,200,000 tons, while the output is estimated at 1,080,000 tons, but it is not merely this discrepancy of 120,000 tons with which the Commission is concerned. They wish to secure stockpiles of copper as protection against a possible national emergency, and ways and means of importing the Latin American product are being examined although no conclusion concerning the treatment of the import excise tax of 4 cents per pound has as yet been reached.

The only points of strategic mineral delivery thus far designated by the Procurement Division of the Treasury and the Metals Reserve Company (RFC) are for chromium at New Cumberland, Pa.; tungsten and quicksilver and tin at Columbus, Ohio, and manganese at Baltimore, Md. An interesting point has arisen concerning the competition of domestic producers with those of foreign countries under the "Buy American Act." On March 27, 1939, the Director of the Procurement Division issued a ruling which in effect operates to permit awards of purchase to domestic bidders who name prices 25 percent higher than foreign producers. This means that if, for example, the foreign bid is $100 the domestic bidder who bids $120 is considered as low. The authority for this ruling is contained in Public Law No. 428, approved March 3, 1933, the text of which reads in part, "Unless the head of the department or independent establishment shall determine it to be inconsistent with the public interest, or the cost to be unreasonable, only such" . . . (articles as are produced in the United States) . . . "shall be acquired for public use."

Thus far the new priorities board of the National Defense Advisory Commission has approved a system of voluntary preference ratings which are to serve as indications to manufacturers of the order in which defense contracts placed by the army and navy are to be filled. For the time being, however, the Board has decided against applying preference ratings to all supply requirements of a specific industry, preferring to restrict such ratings to individual contracts.

Senator Taft of Ohio has called for the creation of a war resources board under a single administrator empowered to cut through red tape and seek "industrial teamwork for defense." The Senator's proposal follows the Industrial Mobilization Plan of 1939, which was developed largely by the War Department and which has really formed the basis for a great deal of the work being done today under the name of the National Defense Commission.

Bauxite Supply Ample

An adequate supply of bauxite, principal raw material used in the manufacture of aluminum, is available to this country, Edward R. Stettinius, Jr., of the National Defense Commission, has stated.

About 55 percent of the bauxite used in the United States is imported, Stettinius said, and the balance comes largely from Arkansas.

"Imports from Dutch Guiana will be increased and greater production also is anticipated in Arkansas," the statement said. "While the Defense Commission does not anticipate any interruption in the supply from South America, it is estimated that the supply of bauxite available in this country, even where imports suspended, is sufficient to take care of requirements for at least eight years. It is pointed out that mining facilities in Arkansas could be expanded considerably within a few weeks."

General view of exhibits in North Hall at the 1940 Show

Coal Show Program Gets Under Way

SIXTEEN hours of convention sessions—how to utilize them to best serve the coal mining industry and each of the thousands of mining men who will attend the 1941 Coal Show at Cincinnati, April 28-May 2.

That's the problem that faced the National Program Committee when it met in Cincinnati on November 26 to organize the Convention program. Under the direction of Chairman George B. Harrington, the state chairmen reviewed the reports of state committee meetings held late in October and drew up a well balanced program that promises to pack convention sessions full of interest and value.

Coal Show Week is indeed a red letter date for coal mining men. The four days' meetings, coupled with the manufacturers' exhibits, constitute an annual review of the industry's progress in operating and economic problems and set the pace for its further advancement. With the additional burdens entailed in meeting defense requirements and getting out coal under present regulatory legislation, operating men are more eager than ever to find solutions for their common difficulties. This situation was apparent in the deliberations of the program committee which is making every effort to arrange a stellar slate of convention papers.

Mechanical mining methods and equipment, coal preparation, safety and national economic problems will be highlighted, with plenty of time devoted to related issues of haulage, power, roof support, equipment maintenance, ventilation and supervision. The complete program will cover modern mining from top to bottom—not in the sketchy way of a general review, but definitely presenting the best thought of the industry in an exhaustive, practical manner.

Tentative Convention Program

Monday Morning, April 28—

Opening addresses.
(1) National Economics.
(2) Face Preparatory.

Monday Afternoon, April 28—

(1) Mechanical Loading.
(2) Mechanical Loading.
(3) Mechanical Loading (Safety).

Tuesday Morning, April 29—

(1) Equipment Maintenance.
(2) Lubrication.
(3) Power.

Tuesday Afternoon, April 29—

(1) Service Haulage with Mechanized Loading.
(2) Main Haulage with Cars & Conveyors.
(3) Roof Support for Mechanized Loading.
Also Special Stripping Session.

Wednesday Morning, April 30—

(1) Surface Preparation.
(2) Surface Preparation.
(3) Surface Preparation.

Wednesday Afternoon, April 30—

(1) Conveyor Mining.
(2) Conveyor Mining.
(3) Conveyor Mining (Safety).
Also Special Stripping Session.

Thursday Morning, May 1—

(1) Safety.
(2) Ventilation.
(3) National Economics.

Thursday Afternoon, May 1—

(1) Stream Pollution.
(2) Vocational Education.
(3) Supervision.

Two Special Sessions on Strip Mining

The special strip mining session last year met with such wide approval and was so well attended that plans have been laid this year for two such meetings. These will be held concurrently with the regular convention sessions on Tuesday and Wednesday afternoons.

Thus, strip mining people will have ample time for consideration of problems peculiar to their operations, and will also join with deep-mine operators in discussions devoted to common issues.

How It's Done

No doubt there are many who do not understand the process of formulating a Coal Show program, or realize that the final program is definitely a work of the industry itself.

First, an outstanding coal mine operator is chosen as National Chairman to lead the job from begininng to end. Second, state chairmen are selected from each of the major coal producing states or areas, to assist the National Chairman and to insure that the views and opinions of every field receive full consideration. Third, each state committee is organized from a group of experienced operating officials, the total membership of all committees being nearly two hundred.

A letter ballot is sent out to operating men and manufacturers throughout the country, for an expression as to the general subjects for the program. Each state committee then meets, reviews the results of this survey and formulates its recommendations for specific convention papers,

methods of procedure, attendance building, etc. These results are summarized and coordinated at the meeting of the national committee, which outlines the final program and chooses the actual papers to be presented—in fact, completes a "keyhole" job of the Cincinnati program.

Thus it will be seen that the Coal Show program is not just picked from a hat—but quite the opposite, is the result of the collective expressions of an industry-wide group as to the most profitable use of the 16 hours of convention sessions when the nation's coal men gather for their annual conclave.

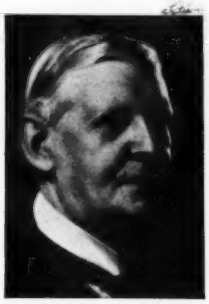
GEORGE B. HARRINGTON
National Chairman

—State Chairmen—

Alabama

W. C. CHASE
Alabama By-Products Corp.

Virginia



CHAS. E. RALSTON
Benedict Coal Corp.

Kentucky

J. E. BUTLER
Stearns Coal & Lumber Co.

Tennessee

HUGH P. FINLEY
The Proctor Coal Co.

Illinois

CARL LEE
Peabody Coal Co.

Indiana

A. K. HERT
Snow Hill Coal Corp.

Pennsylvania

T. R. JOHNS
Industrial Collieries Corp.

Strip Mining

T. G. GEROW
Truax-Traer Coal Co.

Ohio

C. W. JEFFERS
United States Coal Co.

West Virginia

R. H. MORRIS
The Gauley Mountain Coal Co.

West Central

WM. R. CHEDSEY
Missouri School of Mines and Metallurgy

Rocky Mountain

T. E. JENKINS
National Fuel Co.

The March of COAL MINING

Ten Years of Progress

SERVICE HAULAGE for MOBILE LOADING MACHINES

By G. B. SOUTHWARD
Mining Engineer
American Mining Congress

AS a starting point, let us agree on two facts. First, that mobile loading machines provide the most economical and most efficient method which has yet been devised for loading coal at the face. Second, that mine cars provide the most economical and the most efficient method for main line haulage. Then, with this as a basis, let's go on from there and consider how to bridge the gap between these two operations and how to do it in the simplest way.

There are three accepted types of equipment used for transporting coal from a mobile loader to the main line haulage—mine cars, shuttle cars and conveyors. Each of these has proven efficient and economical under certain conditions, but no single one of them has yet been developed to the point where it can be considered as being the best for any and all conditions. As generally happens in a situation of this kind, there are certain places where one of these types is obviously the best and most economical, but there are also overlapping zones where the advantages and disadvantages of two or more of the methods seem to be about balanced. In such cases there must be detailed examination and analysis before the correct choice can be made.

Relation Between Panel Operations

In investigating and determining the type of equipment to use for the service haulage, it is advisable to take a long-range view of all of the panel operations so as to get a proper perspective on the relative value of each one. Keeping in mind that these operations consist of cutting, drilling, shooting, loading, haulage, ventilation, power, timbering, etc., it is at once apparent that the movement of the coal from the loader to the main line is only a part of the total, although an extremely vital part. The performance of the service haulage does of course affect the total production of the unit, and in this way has a direct and marked effect on the production cost; this, however, is true of all work underground, and an attempt to say which phase is the most important is about the same as trying to decide which is the most important leg in a three-legged stool.

This fact is illustrated by the chart in Figure 1, which is repeated from an article published some months ago. These figures are an average taken over a period of several months at an active operation, and while they may not apply exactly to all mechanized mines, they do show the general relative value of the different kinds of work that are combined to make a complete mechanical loading unit.

Selection of Haulage Method

Coming back to the direct consideration of service haulage, there are a sufficient number of installations with mine cars, shuttle cars and conveyors now in use to provide an accurate basis for determining which one is best adaptable to any individual

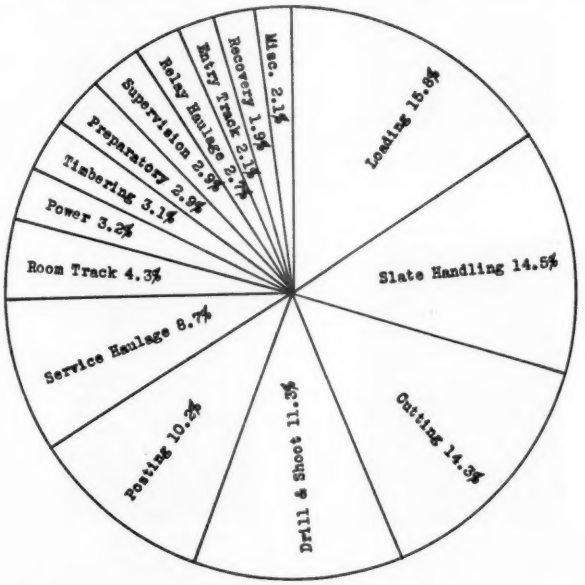


Figure 1

Division of the cost of all work from the face to the main line haulage

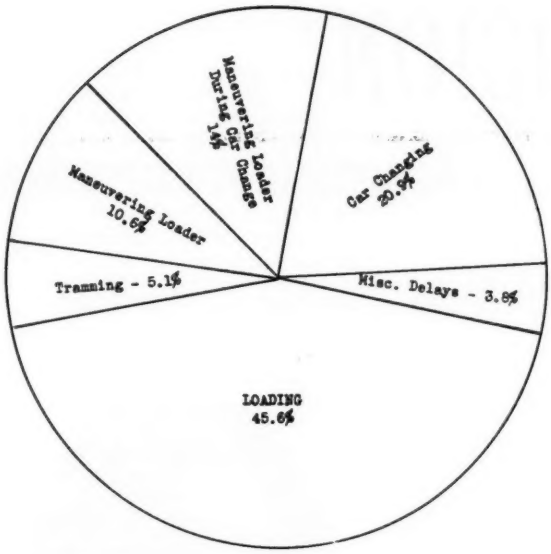


Figure 2—
Time study of a mechanical loading operation showing all face work done during a shift

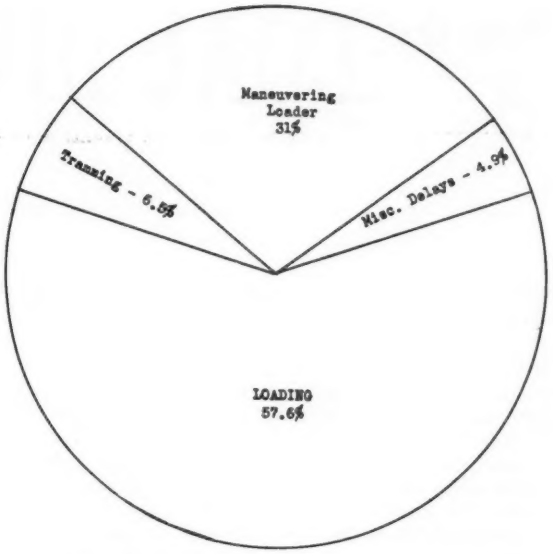


Figure 3—
Calculated revision of Figure 2 showing effect of eliminating the time for car changes

mine. So there is no reason why a coal company should not be able to eliminate guesswork in setting up an estimate of what the service haulage cost and performance would be with the different methods.

In comparing the different systems of service haulage, we should keep in mind that while the type of equipment is of major importance, what really counts is the manner in which it is being used. Therefore, when drawing conclusions between the comparative merits of the three methods of haulage, we must make sure that each one is being judged while operating under equal degrees of efficiency.

The question of the proper car capacity has come in for much attention; some years ago it was thought that the larger the car the greater would be the production, but we know today that this is not true, and that there is a limit to the capacity of the car beyond which the increased purchase price does not yield proportionate returns in coal output. This means, in effect, that there is also an economical limit to the amount of money which can be spent for service haulage—whatever type of equipment is used—beyond which the investment does not pay.

Continuous operation of the loading machine at the face is the point toward which we are working, but under present systems of mining, this goal cannot be reached. The reasons are obvious—in the first place, a working face underground does not supply sufficient coal for a shift operation for a loading machine; therefore, the machine has to tram from place to place with the consequent loss of productive time. Second, a machine at the face is not stationary while loading; it has to be in continual movement, either forward or sideways, so that the loading head can reach the loose material, and this again means a certain amount of time spent in maneuvering. Then, in most mines there are apt to be other incidental delays for setting safety posts, for digging out tight shots, for removing impurities, etc.; probably they should not occur, but they do occur, and no system of service haulage can eliminate them.

Time Study of Face Operations

The charts in Figures 2 and 3 are taken from an actual time study in an operating mine; this is submitted to show the avoidable and unavoidable time losses at the face, and to indicate which ones are attributable to the service haulage. The mine in question has a fairly thick seam and is operated by mobile mechanical loaders with medium capacity steel cars. The results, as in the case of Figure 1, are not intended to apply to all mines, but at that, they are probably fairly representative of average modern performances.

Figure 2 shows the division of all face work during the shift, and it will be noted that the loading time amounted to 45.6 percent of the total. The actual time lost waiting for cars was 34.9 percent of the shift, but during 14 percent of this waiting time the loading machine was being shifted into new positions. Therefore, this 14 percent was properly charged against "maneuvering," so that the real loss of productive time due to car change was only 20.9 percent of the shift. Whether maneuvering should be classed as productive or non-productive time is a matter of opinion, but whatever the classification, the fact remains that while the machine is shifting, it is not loading coal.

Figure 3 re-divides this time study and shows what would happen if there were a continuous car supply at the machine at all times. This is done by eliminating the 20.9 percent of idle time for car change in Chart A and re-calculating the remainder of the shift on a 100 percent basis. The revision indicates that even if there were no lost time from the car changes there would still be 42.4 percent of the shift spent in non-producing time by the loader—31 percent for maneuvering, 6.5 percent for tramming, and 4.9 percent for miscellaneous delays. This would leave 57.6 percent of the shift for the actual loading time of the machine.

These charts serve to illustrate how far the service haulage can and cannot go toward increasing the production of the machine and raising the efficiency of the unit. As stated above, it is not the intention to say that these figures apply to every mechanical mine, but they do indicate the method of determining what can be expected.

With the COAL DIVISION

of the AMERICAN MINING CONGRESS

ANNUAL CONFERENCE of the Committees

THAT improved operating technique and equipment demand everlasting effort on the part of the coal mining industry, was the keynote of the Sixth Annual Conference of the Mining Congress Coal Division held at the William Penn Hotel in Pittsburgh on November 15.

More than 100 coal mining men attended the meeting and took part in the deliberations of the Coal Division committees during the day, which were followed by a banquet in the evening. Committee accomplishments during the past year were summarized and a program of future work was recommended.

Mechanical Loading, Surface Preparation, Conveyor Mining, Haulage Roads, Underground Power, Roof Support, Stream Clarification and Safety Committees spent the entire morning in separate sessions putting the final touches to their reports and outlining new projects. The afternoon session was devoted to presentation of these reports to the entire Division, and open discussion of common problems facing the industry. A summary of these reports is given below.

Since its inception, the Coal Division of the Mining Congress has pointed its efforts to benefitting the coal industry through a free exchange of ideas and information between the executive, engineering and operating groups. Throughout the year, industry-wide committees pursue their program by correspondence and individual committee meetings, the work culminating in the Annual Conference. Reports of the committees are broadcast to the industry through the MINING CONGRESS JOURNAL, *Coal Mine Modernization Year Book* and special publications as required.

Proving that good fellowship follows hand-in-hand with the serious side of coal mining, the annual banquet concluding the Conference was a huge success. R. L. Ireland, Jr., presided as toastmaster, introducing the following well known mining men: Carl Scholz, consulting mining engineer and past president of the Mining Congress; D. C. Kennedy, secretary, Kanawha Coal Operators Association; P. C. Thomas, vice president in charge of operations, Koppers Coal Company; S. A. Taylor, past president of the Mining Congress; Harry M. Moses, president, H. C. Frick Coke Company; Charles C. Whaley, Myers-Whaley Company; and Julian D. Conover, Secretary of the American Mining Congress.

In brief introductory remarks, Mr. Conover said: "The basic idea behind the work of your Coal Division, as you know, is that we must keep everlastingly at the problems of improving our operating technique and equipment. We can't sleep on the job for a moment. Our competitors, oil, gas, and hydro-electric power, are continuously improving their technique and using every possible scientific and mechanical aid, and we simply have got to keep on our toes all the time if we are to keep ahead of the procession.

"As Harry Moses emphasized at our Coal Convention in Cincinnati last spring, the coal industry is not sick; it is on its feet and fighting, but we have to stay in there and pitch ever minute. We can't let up; we must be working on this job every week and every month and every year. It is a job that is never finished."

Two Past Presidents Attend

Two past presidents of the Mining Congress attended the meeting and lauded the work of the Coal Division committees. Carl Scholz recalled his presidency during which the publication of the MINING CONGRESS JOURNAL was inaugurated and concluded "Today the MINING CONGRESS JOURNAL is one of the finest papers published." The early years of the Mining Congress were also reviewed by S. A. Taylor, who pointed out the growth of the organization which has made it "a very effective agent, not only in the precious mining fields but especially in the coal mining industry."

R. L. IRELAND, JR.
Chairman, Coal Division

"The problems of the industry are many, and will be for a long time," commented D. C. Kennedy in saying that he was not surprised that some of the committees have been organized for ten years because he himself has been working on some of the problems for 37 years. Telegrams were read from Howard I. Young, President of the American Mining Congress, and George B. Harrington, president of the Chicago, Wilmington and Franklin Coal Company, and chairman of the 1941 Coal Show Program Committee. Both Mr. Young and Mr. Harrington complimented the Coal Division on its fine work in behalf of the industry and urged its continuance in full force.

The troubles of the industry were recalled by P. C. Thomas, who pointed out that "the transition going on in this industry is something marvelous." He added that mechanization is going on today so rapidly and so definitely in all endeavors that it will only be a short time before the industry is completely mechanized. Charles C. Whaley spoke in behalf of the manufacturers cooperating in the work of the Mining Congress and expressed real satisfaction over the accomplishments of the Coal

Division and the success of the annual Coal Show at Cincinnati.

The tremendous interest taken in these Coal Division meetings and the valuable work that the committees do in presenting their ideas to the mining industry was recognized by Harry M. Moses. "It has always impressed me as being the most unselfish organization that I have ever had any association with," he said, in commenting on the fact that after they do all the work, spend all this time and use their personal energy and personal ideas, the results are disseminated and distributed freely to the industry. He also pled the necessity of creating incentive for young men to get into the industry, saying "I really believe there is a lot of prosperity and future in the coal industry in spite of all the hazards and hurdles we have had in the past."

St. Lawrence Waterway Scored

Chairman Ireland told the assembly in plain words that their like represented the hope of the coal mining industry. "In such a group as this we have these who have the intestinal fortitude to figure something out and recommend it—and then make it work, if they can get the support of the brass hats," he said in urging a vigorous continuance of their efforts to promote better mining practice and better relationship within the industry. He condemned the St. Lawrence Waterway and Power project in no uncertain terms and spoke at some length on the direct and indirect manner in which it would adversely affect the coal mining industry and the prosperity of the entire nation.

Mine safety was pointed out as one phase of operation which must receive continuous attention, and Mr. Ireland stated that an important job for coal mining men was to persuade their own state legislatures to quit treating the coal industry as a side-line and to appropriate the proper funds to support adequate state mining departments. It remains then for mine operators to give full support to such state mining department so that they can do a real job in promoting safety in and about our mines.

Speaking of the relationship between operators and manufacturers he said "The American Mining Congress has always been very close to me because it has performed a service that no other association that I know of in any industry has done nearly as well, and that is to create that close liaison between the producer and the manufacturer of the tools he uses. This industry more than any other industry except the farming needs retooling and needs it in a big way. I want to rise to the defense of the manufacturers, to say that all their shortcomings are our shortcomings, that they will meet any situation, any crisis, will manufacture anything we demand but that they wouldn't be so plain foolish as to build something better than we wanted until we know that we want it."

Reports of the Committees

COMMITTEE ON SURFACE PREPARATION

This committee is conducting studies on various phases of coal preparation, and Mr. T. W. Guy, chairman, called on several of his members to outline the reports which had tentatively been submitted. A preliminary report on Dewatering was presented by C. P. Proctor, which gave the results on drainage tests that had been conducted on different sizes of treated and untreated coal. A report was also submitted by George Arms explaining a satisfactory method of determining and studying screen efficiency, and a paper by Thomas Fraser outlined the factors which affect performances and the ratings of vibrating screens.

COMMITTEE ON MECHANICAL LOADING

The subject of Cost Keeping for Mobile Loading Machines has been selected by this committee for their next report, and S. M. Cassidy, chairman, stated to the conference that their first step had been to investigate cost-keeping methods now in use by representative coal companies. Preliminary reports were submitted by the following members: S. M. Cassidy, Geo. S. Brackett, W. R. Cuthbert, and C. W. Gibbs, and an examination of these studies brought out the fact that there were widely divergent views on this subject. The committee, therefore, instead of attempting to correlate these ideas into uniform recommendations, decided that it would be better to have their report present a number of different representative methods of keeping costs.

COMMITTEE ON CONVEYOR MINING

A daily inspection form has been in preparation by E. B. Gellatly and R. C. Beerbower, and this subcommittee reported that, because of the difficulty in devising a standard form that would fit all types of conveyor operations, it might be found necessary to recommend more than one form sheet.

A study on Cost Keeping for Conveyor Mining has been under way for some months, and T. F. McCarthy, chairman, submitted two tentative reports—one which he had prepared, and a joint report by R. G. Pfahler and W. C. Fancourt.

The committee has found that because of the several distinct types of conveyor mining, as well as the individual views on cost-keeping methods, it had not been practicable to correlate these into a uniform recommendation, and their completed report would show the different cost-keeping procedures now in use.

COMMITTEE ON HAULAGE ROADS

A study on Service Haulage Roads has recently been started by this committee, and Mr. R. V. Clay, chairman, explained that it was the purpose to recommend the material and the construction methods for efficient service haulage systems for mobile loading machines. A preliminary report was submitted by C. C. Hagenbuch which outlined the data that was necessary to be gathered, and carried his report to a conclusion by showing construction costs for a service haulage layout, including depreciation and recovery of material. Mr. Clay then explained that a number of similar reports would be made on operating mines, and the committee would then have definite and authoritative data on which to base their recommendations.

COMMITTEE ON UNDERGROUND POWER

Several studies on various phases of underground power for coal mining are now being prepared by the committee, and K. L. Konnerth, acting as chairman pro tem in the absence of C. C. Ballard, outlined these studies to the Conference. A report on the Carrying Capacity of Conductors, submitted by A. L. Johnston, contains a number of tables and graphs which are designed especially for coal mining service, and a series of charts, prepared by F. L. Stone, gives additional information on line resistance and

voltage losses. Both of these reports were prepared in recognition of the fact that tables of this nature, specifically calculated for coal mine use, are not now in existence, and that there is a real need for such information by coal mine operators in selecting the proper underground power lines.

A preliminary report on Lightning Protection for Underground Circuits was submitted by F. P. Brightman and D. E. Renshaw, and a study on Power Distribution Lines for Mechanical Loading and Conveyor Mining has been started by W. F. Roberts.

COMMITTEE ON SAFETY

This committee has recently completed a set of safety rules for coal mining, and J. J. Sellers, chairman, announced that most of these had now been accepted by the committee and had been published in several issues of MINING CONGRESS JOURNAL. These rules cover the general operations of mining and also special operations, such as mechanical loading, conveying, etc. He further explained that it is not the thought of the committee for these rules to be adopted verbatim by a mining company, but they were intended to be used as a guide by an individual operator to cover such hazards as might exist at his own mine.

The committee is now engaged in a study of methods used by different companies to promote safety consciousness among their employes. A survey has recently been completed by the American Mining Congress among a number of representative companies, and the result of this survey was presented.

COMMITTEE ON ROOF SUPPORT

This committee, as explained by A. E. Long, chairman pro tem in the absence of F. G. Smith, has started a study on roof support materials. This is being made by A. R. Joyce and E. H. Heald, and their report will cover strengths of the different materials as well as methods of construction, and will submit a set of tables which will show comparative strengths between standard sizes of wood and steel beams.

A report on roof breaks and ground subsidence in pillar mining is being started by A. E. Long and L. N. Plein. The purpose of this report will be to correlate the different types of roof action that are encountered in complete extraction, and a data sheet, prepared by A. E. Long, will be sent to a number of companies for gathering information under various roof conditions and mining systems.

COMMITTEE ON STREAM CLARIFICATION

The purpose of this committee is to gather all available data on methods which have been used to neutralize or eliminate the discharge of acid mine water into streams. J. W. Woomer, chairman, stated that the purpose of their report would be to present factual data to the coal industry that would prevent useless experimentation in methods on which results are already known, and to attempt to discover what methods, if any, can be applied successfully. All available data on this subject, resulting from thousands of experiments, indicate that there is no one method yet devised which can be applied universally, and much needless expenditure can be avoided through the dissemination of known facts.

Developments in Placer Mining

(*Continued from page* 29)

producing counties. One out of the first seven ranking counties has potentialities (mostly unexplored and untested) in value of future production greater than the total amount of placer gold produced in Colorado during the past 70 years. Among the 19 counties which so far jointly produced only less than 1 percent of the value of placer gold from 1868-1938 there are at least seven which, upon further exploration, study and development, might produce millions of dollars in placer gold. A county which ranks as one of the smallest placer gold producers to date may have a potential production approaching, along one stream, one-half of all the placer gold value so far produced in Colorado.

During the period 1858-67 the total number of producing counties was six. This had increased to 17 cocnties in 1907, to 22 counties in 1931, and to 34 counties by the end of 1938. While, during the period of 1858-67, five counties produced 98 percent of the total placer production of the state, by 1938 it took 15 counties to produce 98 percent of the total placer production. During 1937, 18 drag-line excavators with mechanical screening and sluicing equipment produced 66 percent of all placer gold in Colorado. During 1938 the number of such operators had increased to 27 and their production had increased to 86 percent of the total output of the state.

Future Outlook Is Bright

Placer mining in Colorado, with respect to number of localities and number of operators is distinctly and positively on the increase and production will reach its highest peak *in the future,* rather than having reached it *in the past.*

While there are perennial streams in this state which show bucket dredge placer possibilities over distances of 150 miles or more on which, to my knowledge, not a single test hole has so far been put down, our greatest future of placer mining in Colorado lies in the development of small and medium size deposits containing from 500,000 cu. yds. of material upward and showing average values from 25 cents upward. Average values as high as $1.85 per cu. yd., determined by careful and thorough testing methods have been encountered in some deposits.

I believe that the placer possibilities of Colorado have been overlooked by many but, in order to bring these possibilities to the fore, *more* than the ability to move dirt is necessary.

Mining Geology Today

(*Continued from page* 38)

samples for actual testing in the physics and chemistry laboratories. These he must do if he is to understand the operations which have taken place in the past, to produce the geological formations which we see today.

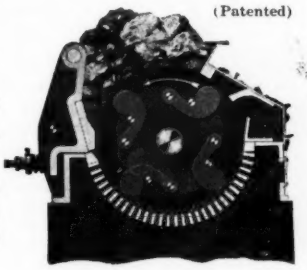
I am a geophysicist as well as a geologist, but I prefer to call a man like that a geophysicist, because he is a man who knows the *physics of the earth*—which is the meaning of the word geophysics. I won't quarrel with you, however, whether you call him a geophysicist or a geologist, as long as he is equipped with physics and chemistry.

I should like to leave that thought with all; with the operators, to suggest to them that those are the men to whom they must look in the future for their personnel; and with the educators, to sketch the lines along which I think, and with me a great many others think, the geologist of the future must be trained.

SMALLER SIZES—STOKER COAL

ONE OPERATION MINIMUM FINES

(Patented)



By reducing lump, egg, nut and ROM coal to 1" and smaller sizes you can meet new market demands as they appear. The Jeffrey slow-speed crusher will turn the trick . . . in one operation . . . with minimum fines.

With this modern unit you can:—

Increase production of domestic stoker coals above normal output from screenings operations
Meet the demand for crushed coal of a size suitable for pulverization
Improve the quality of normal smaller slacks by sweetening with crushed coal of lower ash content
Make a uniform small size with small per cent of fines for cooking purposes.

One of the heavy steel "Flextooth" crushing elements is shown at the left. A cross-section of the Jeffrey Flextooth crusher is shown above. Also single roll crushers and stokerkol sizers for coarser-sized products.

THE JEFFREY MANUFACTURING COMPANY

958-99 North Fourth Street
COLUMBUS, OHIO

Here's

Where GARDNER-DENVER Loaders Prove It with PERFORMANCE

Not in mere claims—but *on the job!* That's where GD-9 Mine Car Loaders prove their better performance.

- That's where they show what it means to have two 5-cylinder radial air motors, specially designed for mine car loader service—and built by Gardner-Denver.
- That's where they show what it means to have plenty of power to crowd into the most stubborn muck pile and to come up with a full dipper every time.
- That's where they show their ability to load either small or large cars, quickly.
- That's where they prove their operating economy and low maintenance costs.
- That's where they prove their ability to perform efficiently on any air pressure, even as low as 40 lbs.

Bulletin GD-9 contains detailed description and specifications for all sizes of Gardner-Denver Mine Car Loaders. Write today for your copy.

And send us a dimension sketch of your mine car for individual recommendations that will save money for *you* in *your* mine. There is no obligation. Gardner-Denver Company, Quincy, Illinois.

In a recent 3-month period, three GD-9 Loaders—in constant use in a large gold mine—mucked a total of 24,000 tons. Maintenance costs have been practically nothing, and the owner reports, "We couldn't manage without our GD-9 Loaders."

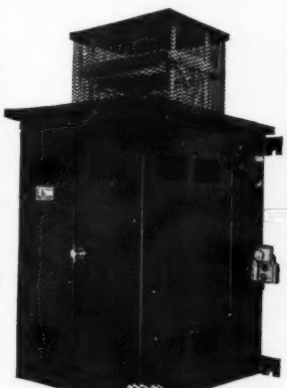
* * * * * *

"Installing a Gardner-Denver Mine Car Loader in our mine speeded up production from 27 tons mucked per eight-hour shift to 68 tons mucked per shift," says the very much pleased superintendent of a money-making Western metal mine.

GARDNER-DENVER
SINCE 1859

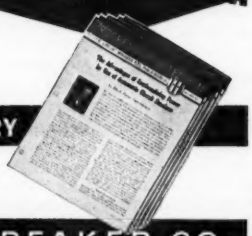
The VALUE of SECTIONALIZING with I-T-E AUTOMATIC RECLOSING CIRCUIT BREAKERS

Raise production; reduce fire hazard; lower maintenance charges; decrease total energy consumption and power demand. These advantages with Automatic Reclosing Circuit Breakers are fully described in I-T-E bulletins based on actual installations in mines.



At right—Each circuit breaker controls a section, confining disturbances to the area in which they arise.

Representatives in Principal Mining Areas



BULLETINS TELL THE STORY

These bulletins deal with a variety of mining conditions. Copies will be gladly furnished on request.

I-T-E CIRCUIT BREAKER CO.
PHILADELPHIA, PA.

PERSONALS

James H. McNeal has been appointed purchasing agent of the Weirton Steel Company to succeed the late E. H. Kern. Mr. McNeal, who will have his office at Weirton, W. Va., has been connected with the company since 1918 and for a number of years has been assistant purchasing agent.

B. F. Webster, Jr., formerly general manager of the Old Hundred Gold Mines, and who has been actively connected with other operations in Silverton, Colo., for a number of years, is now associated with the Nevada Consolidated Copper Corp. at McGill, Nev.

I. W. Miller has resigned as chief of the coal mining department of the Tennessee Coal, Iron & R. R. Company to accept an appointment as general superintendent of mines for the Black Diamond Coal Mining Company and associated companies in Tennessee and Alabama.

Roy Jellison has been named superintendent of the new tunnel project of the Cornucopia Gold Mines, Inc., at Cornucopia, Oreg.

Hooper Love has been elected president of the West Kentucky Coal Co. and its subsidiaries. His home is in Nashville, Tenn., and he has been associated with the St. Bernard Coal Co., a subsidiary of West Kentucky Coal Co., for 34 years.

Charles M. McConnell has been appointed as an engineer for the United States Fuel Co. He is now located at Hiawatha, Utah. Mr. McConnell for the past 12 years was associated with the Moffat Coal Co. in the capacity of engineer and assistant superintendent.

Harold Kingsmill, vice president of the Cerro de Pasco Copper Corp., has been elected a director of the American Metal Co.

Clyde Barkis has been appointed superintendent of the Nevada gold mill, near Goldfield, Nev., succeeding **J. D. Holbrook**, resigned.

J. B. James, formerly mine foreman at the New River Co.'s mine at Oakwood, W. Va., has been placed in charge of the Summerlee mine as superintendent, replacing **Edgar Blackwell**, resigned.

Walter J. Kelly has been appointed acting manager of the industrial relations department of the Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., succeeding **J. F. Vance**, retired.

Sherwin F. Kelly has recently formed The Sherwin F. Kelly Geophysical Services, Inc., with head offices in Wilmington, Del., to take care of his geophysical and geological consulting work in the United States. In the Rocky Mountain region, this firm will be represented by **C. R. Wilfley**, mining engineer of Denver, Colo.

L. G. Atkinson has been appointed manager of a new section of the circuit breaker sales department of the Westinghouse Electric & Manufacturing Co., with headquarters at East Pittsburgh, Pa.

Paul C. McConnaughey has been appointed manager of the Newark district of the Koppers Co. He succeeds **William B. Ross**, who has been appointed sales manager of the Philadelphia Coke Co., a Koppers affiliate.

Dr. W. D. Coolidge and **Stuart M. Crocker** have been appointed vice presidents of the General Electric Co. Dr. Coolidge will continue as director of the General Electric Research Laboratory in Schenectady. Mr. Crocker will relinquish his duties as manager of the company's air conditioning and commercial refrigeration department at Bloomfield, N. J., to make his headquarters in New York City, where he will cooperate with and be assisted by all commercial departments in furthering the general interests of the company.

Fred S. McConnell has been elevated to the presidency of the Enos Coal Mining Co. A pioneer in the coal-stripping industry, Mr. McConnell became associated with George A. Enos in 1919 and has been with the organization since that time.

H. A. Damcke has been appointed manager of sales of the New York division of the Island Creek Coal Sales Co. He succeeds the late A. R. Davidson.

S. J. Horrell has been appointed vice president of the Power Piping Division of Blaw-Knox Co., and **Harry Gay** has been named chief engineer.

A. Walter Williams has been appointed dredgemaster and superintendent of the Western Dredging Co. of Nevada, which operates at John Day, Ore.

A. J. Martin has succeeded **J. P. Dunlop** as chief of the Joplin, Mo., office of the U. S. Bureau of Mines.

W. E. Housman has been appointed staff engineer of the H. C. Frick Coke Company. He succeeds L. J. King, and will maintain his headquarters in Pittsburgh.

Joseph C. Arundale, of Miami, Okla., has been appointed statistician for the Tri-State Zinc and Lead Ore Producers Association in Picher, succeeding **Edgar C. Long**, who has resigned to accept a supervisory position with Baroid Sales Co., a subsidiary of National Lead Co.

T. R. Johns, vice president and general manager of Industrial Collieries Corporation, Johnstown, Pa., has announced the following changes in his organization:

W. E. Hall has been appointed Division superintendent of the Preston Division in the Morgantown field. Mr. Hall's headquarters will be at Dellslow, W. Va.

N. A. Elmslie will continue in the capacity of division superintendent of the Marion Division, consisting of the Barrackville and Dakota properties near Fairmont, W. Va.

C. M. Hoard has been appointed superintendent of the No. 41 Mine at Barrackville, W. Va.

K. W. Bartlett has been appointed superintenedent of the No. 42 Mine at Dakota, W. Va.

— *Obituaries* —

William J. Wolf, general manager of operations, Consolidation Coal Company, died Sunday, November 24, at his home in Fairmont, W. Va. He is survived by his wife and one daughter.

Mr. Wolf came with the Consolidation Company in 1915 as superintendent of the Carolina and Idamav mines in Marion County; he was subsequently promoted to superintendent of the Maryland division, and in 1938 was appointed general manager of all their mining operations in Maryland, Pennsylvania, West Virginia and Kentucky. He was a well known figure in coal circles, and his passing will be a great loss to his many friends and associates in the industry.

Herbert M. Gilbert, of Winnemucca, Nev., well known mine operator in both Mexico and the Far West, passed away on October 27 at his home in Winnemucca. He had operated properties in Nevada since 1928 and participated actively in the affairs of the American Mining Congress.

Alfred M. Beasley, 55, manager of the Bunker Hill and Sullivan smelting works at Kellogg, Idaho, died on October 25. He had been with the company since 1917. He is survived by his widow, Ruth; and two sons, Jules and Alfred, Jr.

NEWS and VIEWS

Tri-State Mining Future a Blank Unless Administration Reverses Present Tariff Attitude

Evan Just, secretary, Tri-State Zinc and Lead Ore Producers Association, has issued the following statement commenting upon the position of the zinc industry under prevailing trade treaties:

"Probably at no time in the long history of the Tri-State District has its prosperity 'skated upon such thin ice' as at present. For the time being, the zinc industry enjoys good prices and an active demand for its product, but the mine operator is haunted by fear of what will happen when foreign competition is resumed. As a result of this fear there is less activity in the development of new or idle properties than during any past period of similar price conditions.

"It is a plain inescapable fact that the bulk of Tri-State mining cannot survive a renewal of active foreign competition without more tariff protection than it has had in the past. The foreigner, with his low wage levels and richer orebodies, can produce an abundance of zinc, pay the present duty, and deliver his product in our market at 4½ cents. This metal price means zinc ore prices near $30. Parties familiar with the ore reserves of the Tri-State District know that there are practically no orebodies left which can be mined at such prices, even at starvation wages. The truth is that the district can hardly be expected to maintain its present rate of output for the next two years with zinc ore prices less than $55 per ton. After another year of mining at the present rate, a return to prices that renewed foreign competition plus the present rate of duty will create, will simply kill off the Tri-State mining industry.

"Today our zinc industry is enjoying good times because the war has blockaded or absorbed foreign competition. Those foreign countries still accessible to us, instead of competing to sell in our domestic market, are seeking to buy zinc from us. These demands have pushed zinc prices higher and higher. Domestic smelters, crowded to capacity, cannot meet the needs of a lively domestic market plus these abnormal requirements from abroad.

"But this condition is created and sustained only by the war. What disturbs the zinc mine operator, who would otherwise be pleased to find business so good, is to reflect upon the aftermath, when the war is over. Then he will face aggressive foreign competition, intensified by a desperate need of foreign countries for exchange credits, which are being sacrificed at present to purchase war materials. If such a serious condition arises, what help can we expect from our Government? All one can answer at this time is that the present Administration has not raised, but has reduced, our tariff in the face of such circumstances, and has turned a deaf ear to our pleas for reconsideration.

"It was realization of this threat to its very existence that led the domestic zinc industry to exert itself frantically, trying to persuade the Administration to reverse the attitude taken when the zinc tariff was lowered in the Canadian trade agreement. The industry had good arguments. The Reciprocal Trade Agreements Act provides that the President, before he lowers a given tariff rate, shall make a finding of fact that the existing rate is burdensome to trade. No such finding was reasonably possible in regard to zinc. Also, it was the published aim of the trade agreements organization set up by the President to benefit, not to injure, domestic industries. The zinc industry, taking these professions of faith at face value, believed that when the actual harm done to it was explained, correction would naturally follow. Moreover, the trade agreements officials, in their public statements, assure the people that they only make a concession on a given article to the country which is the principal source of our imports of that article. This policy is supposed to safeguard the automatic extension of concessions to all countries against throwing our trade advantages to the winds. The inclusion of zinc in a treaty with Canada was a direct violation of this presumably sacred principle, as Canada was not the principal source of zinc imports.

"All these compelling arguments were met by the Administration, first with a set of school-boy answers that betrayed a complete lack of understanding of the zinc problem, and later with any kind of twaddle that could be used to disguise a stubborn refusal to apply its published principles to the facts on zinc. In short, the answer was 'no,' regardless of facts. In desperation, the zinc industry, admitting a temporary suspension of

Wm. C. Browning

Accepts Western Division Chairmanship

William C. Browning, general manager, Golden Queen Mining Company, Los Angeles, has been elected chairman of the Western Division of the American Mining Congress, succeeding Merrill E. Shoup, president of the Golden Cycle Corporation, Colorado Springs.

As chairman of the Western Division, Mr. Browning will lead the industry in arranging for the 8th Annual Metal Mining Convention and Exposition to be held in San Francisco, September 29-October 2, 1941. A recognized leader in the metal mining industry, his wide experience and acquaintanceship well fit him to direct the plans for the forthcoming meeting.

The eyes of the industry are already turned to the 1941 Convention which assumes extraordinary significance in view of the key position of metal mining in the national defense effort. Convention committees are to be appointed shortly to permit ample time for formulating the program and completing all arrangements.

harm because of the war, sought some assurance that in case it should be swamped by foreign competition in the future, protection would be granted. Again, the last and final answer was no.

"Being faced with such an unfriendly and inconsistent attitude on the part of Government toward his problems, the American zinc miner is completely in the dark as to his fate when the war is over. He can only assume that the present Administration will continue to ignore his pleas for consideration. This leaves the miner with only one course to pursue at the present time—to take what he can get in the present market and to put no trust in the future. To an industry which must risk money today to develop the ore reserves to be mined 5 or 10 years hence, such a policy can lead to nothing but gradual starvation."

Western Safety Conference

The Sixth Annual Western Safety Conference was held in Phoenix, Ariz., October 14 to 18 and one day, October 17, was set aside for mining industry safety discussions.

The mining sessions were chairmaned by E. D. Bullard, of the E. D. Bullard Co., San Francisco, and Charles F. Willis, secretary of the Arizona Small Mine Operators Association.

Addresses at the morning session were made by J. J. Forbes, of the U. S. Bureau of Mines, Pittsburgh, Pa., on "A Definite Educational Plan for the Metal Mining Industry," and by B. R. Coil, of the Miami Copper Co., Miami, Ariz., on "Safety Devices Recently Developed for Mine Use."

In the afternoon H. E. Hodgson, of the Arizona Industrial Commission, Phoenix, presented an address on "An Analysis of Accidents and Accident Costs at Small Mines," and E. A. Anundsen, of the Phoenix Safety Station, U. S. Bureau of Mines, discussed "The Problem of Accident Prevention at the Small Metal Mine."

Others participating at the mining sessions included R. W. Crabtree, of the Hercules Powder Co.; Louis Watts, California Cap Co.; Fritz Nelson, Coast Manufacturing & Supply Co.; and B. L. Lubelsky, consulting explosives engineer, Philadelphia, Pa.

T. C. I. Announces Expansion Program

A broad program involving expansion of the steel-making and finishing facilities at Birmingham, Ala., of the Tennessee Coal, Iron & Railroad Co., U. S. Steel subsidiary, has been announced by Robert Gregg, president.

The new facilities, when installed, will result in approximately a 20 percent increase in the ingot capacity—a little more than 400,000 tons, and a corresponding increase in the finishing capacity of the Tennessee Company.

These improvements, which will commence immediately, but which by reason of their nature will require about 18 months to complete, will then place the Tennessee Company in a materially improved position to carry out any obligations which may be required as a consequence of the national defense program.

The improvements comprise the following important features: Construction of an additional battery of coke ovens and additional blast furnace at Fairfield Steel Works; improvement to the existing open-hearth furnaces; development of ore and coal mining facilities to meet the requirements of the new blast furnace; additions and improvements to the plate mill at Fairfield, including a new 140-in. 4-high plate mill; additional wire drawing, galvanizing and finishing facilities at the Fairfield Wire Works; and additional progressing and finishing facilities at the Fairfield Sheet Mill.

These changes will necessitate enlarged operations at the ore mines, coal mines, and quarries, including mechanical equipment, additional transportation facilities, and, to the extent necessary, enlargements and improvements in the steam, electric power plants, and the water supply system.

Cerro De Pasco Builds New Zinc Concentrator

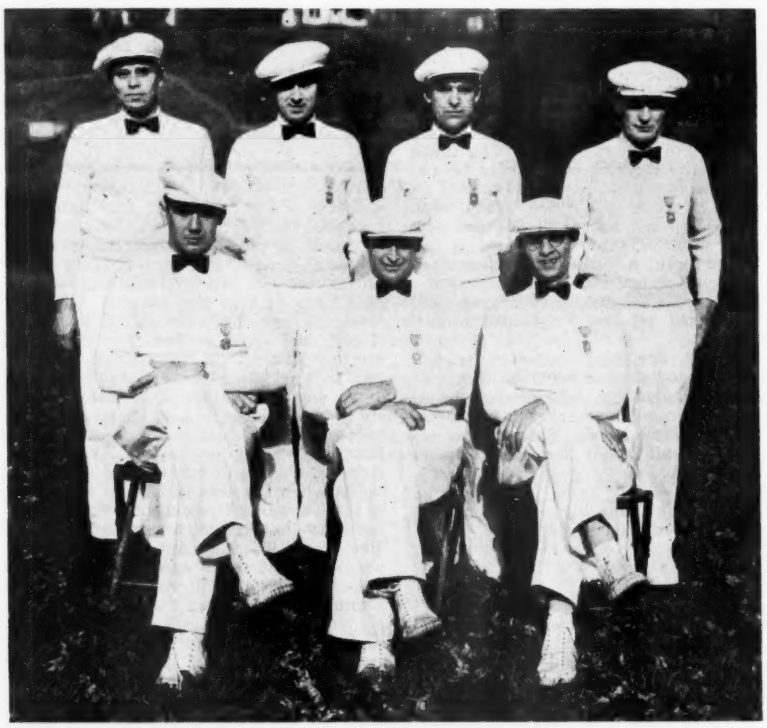
The Cerro de Pasco Copper Corporation is building a new lead-zinc concentrator in Peru which will be ready for operation next year. The company will make use of the concentrator to handle its reserves of zinc-lead-silver ores, already blocked out underground. Last year the company produced over 74 million pounds of copper, over 52 million pounds of lead, and 21,087 short tons of zinc concentrates.

CONSOL TAKES WEST VIRGINIA FIRST AID MEET

Two near perfect first aid teams battled through three extra problems to decide the championship at the twelfth Annual West Virginia State Safety Day held at Morgantown November 15. The Owings team of Consolidation Coal Company repeated its last year's championship when the Nellis team of the American Rolling Mill Company lost by a one-point margin on the third extra problem.

Among the colored teams, first place went to the New River Company team from Mt. Hope, while second place was taken by the Grant Town team of Koppers Coal Company. All winning teams received plaques, while members of the first and second place teams received medals.

State Safety Day, sponsored by the State Department of Mines, climaxed the year's first aid activities which saw hundreds of teams competing in sectional contests. The meet was supervised by William Moore, state mine inspector from Morgantown. J. J. Forbes and G. W. Grove, of the Pittsburgh station of the U. S. Bureau of Mines, headed a group of first aid experts who judged the contest.



Winners of West Virginia State Safety Day—Consolidation Coal Company first aid team from Mine No. 32, Owings, W. Va. They won in 1939, too!

Illinois Mineral Industries Conference

The Illinois Mineral Industries Conference was held November 14-16 at Urbana-Champaign, Ill., with a large number of mining men in attendance. The meeting sponsored jointly by the Illinois Geological Survey, the University of Illinois Engineering Experiment Station, and the Illinois Mineral Industries Committee.

Sessions were given over to discussions of problems of the coal industry, rock and rock-products industry, clay and ceramics products industry, oil and gas, and to geological questions. Industrial minerals were also discussed.

On November 15 the new State Natural Resources Building was dedicated, with President Isaiah Bowman, of Johns Hopkins University, presenting the main address.

Resumes of papers of particular interest to the coal industry are presented below. The paper given by R. E. Howe is printed elsewhere in this issue.

"Public Control of the Coal Industry," C. J. Potter, manager preparation, Rochester & Pittsburgh Coal Co. There are only three factors which control the marketing of coal: Transportation methods and charges, cost of production, and the quality of the coal. Mines now in existence must improve at least one of the aforementioned items in order to improve their economic position. Transportation is practically fixed, under governmental control; cost of production is relatively constant under organized labor and governmental supervision; leaving quality as the only unregulated item. Under these conditions it has been impossible to stabilize the marketing of coal. And now governmental control, under the Coal Act of 1937, represents an attempt to regulate even this last item: Quality. This paper presented theories of the control of coal quality, taking into account minimum prices and items of cost of production and transportation.

"The Railroads' Participation in the Marketing of Illinois Coal," C. N. Lammers, fuel service engineer, Chicago & Eastern Illinois Railway Co. This paper treated combustion conditions as they have been investigated in various industries using rail-hauled coal, and notes the relation between marketing and the use of coal. The C. & E. I. Railroad recently founded a combustion engineering department, established for the following purposes: (1) To give the public unbiased and honest information on the fuels at hand; (2) to assist, when possible, in development of new supplies of coal and oil; (3) to furnish coal users any information and assistance requested, dealing with coal combustion; (4) to inform all mine operators, coal engineers, salesmen and users regarding latest engineering developments; (5) to investigate the causes and correction of air pollution. This program is ambitious and necessitates close contact with research organizations, such as the Illinois Geological Survey. Mineral research and development of mineral deposits bring more traffic to rail lines. The new Natural Resources Building represents one of the dividends that Illinois railroads may realize on the taxes they pay.

"Water-Borne Traffic in Illinois Coal," R. W. Putnam, president, Maritime Engineering Corp. Completion of the 9-ft. channel in the Mississippi above Alton will create a waterway comparable to that of the Ohio River, which has resulted in the development of considerable traffic in water-borne coal. Certain economies are indicated in the movement of Illinois coal along this new route, but since the economies would only materialize with shipments of considerable volume, substantial investments will be required with respect to necessary tow boats, barges, loading and unloading facilities. Predictions as to the future of such developments cannot be made, due to present uncertainties as to joint freight rates and the price-fixing programs of the Bituminous Coal Commission. Possible further extension of the use of bituminous coal lies in the establishment of rates that will permit shipment by rail to Chicago and thence by water to ports on Lake Michigan. These ports are already equipped for the unloading of coal, leaving only the necessity of providing terminals at Chicago for transfer of coal from rail to water. The water vessels will also have to be provided. But here again a substantial volume of shipments will be necessary to justify large investments in terminals and vessels.

"New Information on Coal—In the Field of Physics," R. J. Piersol, physicist, Illinois Geological Survey. Investigations are now in progress covering the physical properties of coal, under three variables: Temperature, pressure and time, and the physical properties of coal components, with special reference to impurities. The paper listed, explained, and related the factors involved in briquetting coal without binder, and presented a method of determining porosity of coal which may prove to be a tool for determining rank of coal. It gives results of investigations of smoke-producing potentialities of Illinois coal, of methods of

United States Senator Key Pittman

A grave on a hillside in Nevada marks the resting place of United States Senator Key Pittman who died on November 10 at the age of 68.

Weakened by his arduous duties as President pro tempore of the Senate and chairman of its Foreign Relations Committee, and by a tiring political campaign throughout the State of Nevada which resulted in his reelection, his courageous and generous heart stopped. Descendant of the Pittmans of North Carolina, the Marshalls of Virginia and of Francis Scott Key, he participated in the stirring events of the Klondike rush and the early days of Nome, Alaska. Although his boyhood home was in Vicksburg, Mississippi, the lure of mining persisted after his Alaskan experiences and brought him from California into Nevada in the days of Goldfield and Tonopah. His desire to champion the cause of mining led him to the United States Senate where for 28 years his brilliant mind and parliamentary ability served the nation and the State of Nevada with its mining and stock-raising population.

Ever the outstanding champion of silver, he maintained the price of that precious metal against heavy odds and only recently succeeded in its remonetization by United States statute for the first time since 1873. One of the last legislative accomplishments of Senator Pittman is the provision in the Excess Profits Tax Law exempting strategic metals and thereby protecting the small miner and the new enterprise from destruction by confiscatory taxation.

A miner himself, he was a friend of all mining men. They miss him now and will continue to miss him. He will not be forgotten.

smoke measurement, elimination of smoke, and methods for burning Illinois coal smokelessly. A new inverted grate was described, and froth flotation removal of ash matter.

"In the Field of Chemistry," O. W. Rees, chemist, Illinois Geological Survey. Experiments indicate that oxidation of coal may be partly due to presence of material related to carbolic acid. Illinois coal is not an oxidizing agent in itself, but it acquires that property upon exposure to air. Iron compounds in the coal do not account for change, so it is thought that organic constituents are responsible. Further studies may reveal the mechanism of the chemical changes and suggest methods for their control. The components of coal—vitrain, clarain, durain, and fusain—have individual moisture-holding capacities, as a function of differences in pore sizes. Below 95 percent humidity vitrain has the greatest affinity for water, and above 95 percent fusain has the greatest capacity. Thus, in preparation processes which tend to concentrate vitrain or eliminate fusain the moisture capacity of the resulting fuel is higher than that of the original coal.

"Recent Researches in Home Heating, by the Illinois Engineering Experiment Station," A. P. Kratz, research professor of mechanical engineering, U. of Ill. This paper comprised a resume of tests run in the Warm Air Heating Research Residence, comparing the performance of hand-fired and stoker-fired forced-air plants. A comparison was made of fuel consumption over a wide range of weather conditions; and the influence of feed rate, burning rate, and fuel-bed thickness on stoker performance was discussed. Results of studies on smoke density were shown, and mention was made of the amount of fly ash collected and the amount of attention required by the different heating equipment used.

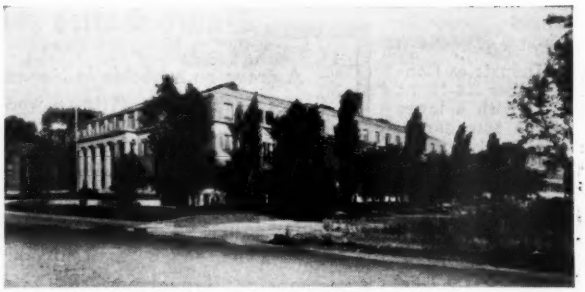
"Visual Record of Combustion in a Domestic Stoker, and Discussion of Method of Predicting Combustion Behavior of Coal," L. C. McCabe, geologist, Illinois Geological Survey. A color movie was shown, with discussion, depicting the effect of the banded ingredients and differences in rank on combustion in a domestic stoker. A laboratory method for predicting swelling characteristics in stoker coals is also presented and correlated with the stoker test results. The tests show that vitrain is responsible for excessive swelling and coke trees; that clarain has a low swelling index and is free-burning. In low-volatile coals and coals of high moisture content these differences are not so important.

PETER F. LOFTUS

Consulting Engineers

ENGINEERING AND ECONOMIC SURVEYS, ANALYSES AND REPORTS ON POWER APPLICATIONS AND POWER COST PROBLEMS OF THE COAL MINING INDUSTRY

Oliver Building **Pittsburgh, Pa.**



Battelle Memorial Institute

Bituminous Coal Industry Inaugurates Two Hundred Thousand Dollar Program of Research at Battelle Memorial Institute

Bituminous Coal Research, Inc., the research agency of the bituminous coal industry, has announced the inauguration of a $200,000 program of research aimed to advance the competitive position of coal by the development of better equipment for its use in home and industry. Following the plan adopted in the previous three and one-half year program of the corporation, Howard N. Eavenson, president, has completed arrangements with Clyde E. Williams, director, Battelle Memorial Institute, to carry on the program at Battelle.

The broad program of research will include studies of methods by which close control of heating and smokeless operation may be combined with the natural advantage of coal as a low-cost source of energy. The direct application of coal as a fuel for metallurgical and ceramic furnaces, methods for the complete gasification of coal for industrial and residential use, and the direct conversion to mechanical energy through the use of coal in a new type of internal-combustion engine are among the problems to be attacked as developed by the research program committee.

That the many thousands of low-cost homes of the country may have cooking and heating stoves that are smokeless and require the minimum of attention, the kitchen ranges and space heaters will occupy a prominent place in the program. In line with the previous program, residential stokers and coals for use on them will be the subject of investigation that the day may be hastened when completely automatic heat with bituminous coal will be readily available to all.

Further research on materials for the dustproofing of coals, with particular attention to those porous coals, now difficult to treat economically, is expected to broaden the distribution of coal that is clean to handle.

Financed jointly by coal producers' associations, by individual producers, and by the coal-carrying railroads, the program is set up for a minimum period of three years. With approximately 25 percent of the country's coal tonnage already enlisted, participation in the movement is open to all interested in the advancement of the interests of bituminous coal. E. R. Kaiser, assistant to the president, who was active in obtaining the support of the producers and the railroads, will continue his efforts to enlarge the scope of the program to a size commensurate with the importance of the industry.

Howard N. Eavenson

A technical committee of fuel engineers representing the companies participating in the program will cooperate with the laboratory in the progress of the work. A smaller advisory group will meet with the research staff at frequent intervals to discuss the latest developments and to steer the program. At Battelle, Ralph A. Sherman, supervisor of the fuels division, will direct the work.

As results are obtained, they will be quickly made available to the supporters of the program through reports and bulletins. Bituminous Coal Research, Inc., also plans to be of service to the members by consultation on specific problems, by the dissemination of information in the current literature, and by coordination of research on coal in all parts of the country.

A. I. M. E. Anthracite Section Meeting

Late in October over 250 mining men attended the Wilkes-Barre, Pa., meeting of the Anthracite Section of the American Institute of Mining Engineers.

Papers presented at the meeting and their authors included: "Water Problems in the Anthracite Area" by S. H. Ash, U. S. Bureau of Mines; "Mechanical Loading and Organized Work Cycles Result in Fast Tunnel Driving in Delaware Aqueducts" by Fred Stiefel, chief engineer, Samuel R. Rosoff, Ltd.; and "The Benefits of Fast Tunnel Driving in Anthracite Coal Mines" by J. H. Pierce, president, East Bear Ridge Colliery Co.

W. H. Lesser, section chairman of the institute, presided.

Colorado Mining Association Annual Convention

The Colorado Mining Association will hold its annual convention in Denver, Colo., January 24 and 25, 1941. On the evening of the 24th of January the Silver Banquet will be held, and on the 25th the traditional "stag" affair is scheduled.

A great deal of emphasis will be laid upon getting "old timers," those mining men who formerly mined in Colorado but who are now located throughout the country, to attend the meeting, and particularly the banquet.

Preliminary plans are now being made and all indications point to a "bang-up" meeting and an enjoyable program of entertainment.

Conveyor Belt Operation and Maintenance

There is an increasing use, in the coal mining industry, of conveyor belts for various classes of service—surface preparation plants, slope haulage, and underground transportation. The cost of operating this type of equipment is naturally being given quite a little attention by coal operators, and it is being realized that there are many factors which affect the cost and the efficiency of a conveyor installation. The final cost figures are, of course, the "per ton cost" and there are five major items which govern this.

(a) Life of Belt in Years.
(b) Total Tons Carried.
(c) Investment Charges.
(d) Operating Cost.
(e) Maintenance Cost.

The investment charge is a direct relation between items (a), (b), and (c), and can only be found after a long period of service, while the operating and maintenance costs can be determined at closer intervals. However, after the costs are figured, in order to know whether these are satisfactory or are within reasonable limits, there are numerous details covering the design of the installation, material handled, operating method, etc., that must come in for consideration.

The wide scope of the investigation necessary in making a correct analysis of a belt performance is illustrated in an inspection data sheet that has been prepared by C. W. Staacke, belting engineer, The B. F. Goodrich Company, Akron, Ohio. The following abstract from this sheet eliminates many of the details which must be examined and taken into account by an engineer, but the condensed form is submitted here to show the principal factors that have a bearing on the efficiency and cost of a conveyor operation.

INSTALLATION

Conveyor

a. Length of conveyor line.
b. Horizontal distance between ends.
c. Vertical distance between ends.
d. Angle of incline.
e. Type and construction of belt.

Conveyor Drive

a. Type of starting.
b. Location of drive.
c. Type of drive.
d. Pulley diameter.
e. Arc of belt-pulley contact.
f. Type of speed reducer.
g. Efficiency of motor and drive.

Conveyor Feed

a. Chute or hopper.
b. Conveyor.
c. Screen.
d. Crusher.
e. Number of loading points.
f. Total drop to belt.

Conveyor Accessories

a. Type of take-up.
b. Movement of take-up.
c. Type of trippers.
d. Number of trippers.
e. Type of idlers.
f. Spacing of idlers.
g. Type of Bearings.

OPERATION

Power

a. Belt speed, empty and loaded.
b. Frequency of starting and stopping.
c. HP input, starting loaded.
d. HP input, running loaded.
e. HP input, starting empty.
f. HP input, running empty.

Material Handled

a. Wet, dry, or sticky.
b. Temperature of material.
c. Weight of material.
d. Size—average and largest.

BELT PERFORMANCE

Causes of Belt Failure

a. Impact at loading point.
b. Impact caused from handling large heavy lumps over idlers at low belt tension or high speed.
c. Poor loading conditions causing cuts, gouges, tears in top cover.
d. Cuts and gouges in center of belt width or parallel with skirt board location indicating poor skirt board design—or lack of belt support beneath loading point.
e. Belting wear from straight abrasion.
f. Edge wear, indicating off center loading, misalignment of conveyor or idlers, too stiff a belt to trough properly.
g. Carcass breaks caused from (1) Excessive build-ups on pulleys when belt tension is high; (2) Moisture, rot, mildew, acid, getting into carcass through cover cuts or even through small pin pricks in cover; (3) Splice failure indicating poor carcass protection, presence of acid, etc.
h. Excessive belt stretch indicating too light a belt for job, or poorly made belt.
i. Belt shrinkage indicating drive is over-belted or originally applied with too much tension.
j. Heat, causing covers to become brittle and crack or to soften and get tacky.
k. Belt exposure to weather, causing sun checks serious enough to require special compounding. (This is usually only necessary where excessive amounts of bright sunlight hit the belt such as at high altitudes in dry, arid, climates.)
l. How are belts cleaned? Rubber scrapers, brushes, water, air.
m. Can present splice method be improved? Are vulcanized splices used?
n. Has belt failure been hastened because cuts and gouges were not repaired by means of vulcanized repairs?

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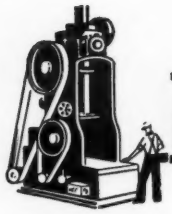


MANUFACTURERS' Forum

Robins Conveying Belt Announces New Advertising Head

The Robins Conveying Belt Company, Passaic, N. J., makers of material handling equipment, have completed the reorganization of their advertising department. Mr. H. Von Thaden, vice president and sales manager of the company, has announced the appointment of Mr. Alfred S. Otton as advertising manager. Mr. Otton will be assisted in his new duties by Messrs E. E. Riches and John M. Lupton.

P. M. Sheriger Named Eastern District Manager for Eimco

P. M. Sheriger, who formerly covered the Montana and Idaho district for the Eimco Corporation of Salt Lake City, has been appointed district manager of sales for the eastern and southern states for Eimco. Mr. Sheriger will maintain his headquarters at the new offices of the company, 120 Broadway, New York, N. Y., to which the branch has recently moved from its former location at 330 West 42nd Street, New York, N. Y. He has had wide experience in all phases of mining and tunneling, and has an intimate knowledge of Eimco products and manufacturing facilities which fit him well for his new position.

Eimco's New York representation has also been strengthened by the appointment of Henry W. Erickson as district engineer. Mr. Erickson is a specialist in the manufacture and application of crushing and grinding equipment.

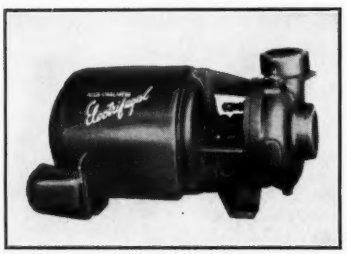
The company has established a service department in its New York office which not only carries Eimco-Finlay loader parts in stock, but also provides competent service engineers to instruct new operators and give any other necessary assistance to users of Eimco equipment throughout the eastern and southern states.

New Offices

The Allen-Sherman-Hoff Company announce the opening of their new offices in New York City at 271 Madison Avenue, telephone Murray Hill 5-9157. Mr. B. C. Berry and Mr. P. D. Oesterle are in charge.

New Electrifugal Pump

Allis-Chalmers Mfg. Company, Milwaukee, Wis., announces its new "Electrifugal" pump which is an all-in-one centrifugal pump especially designed as a complete pump and motor unit on one shaft and one housing.



Instead of using standard motors having special end housings and shaft extensions, the "Electrifugal" pumping unit has a special motor with a one-piece cast iron motor yoke and pump bracket. The feet are cast integral with the housing and bracket and extend under the entire unit instead of under the motor only.

The special motor design, with copper bearing steel cover, meets N. E. M. A. specifications for splash proof motors. Totally enclosed, fan cooled motors and explosion proof motors are also available in the "Electrifugal" type.

In splash proof construction the "Electrifugal" pump is now available in sizes from 1 hp. to 10 hp. inclusive, at 3,500 r.p.m. and from ¾ hp. to 7½ hp. inclusive at 1,750 r.p.m. for heads up to 160 ft. Larger sizes of this type are in the process of design.

For normal service the pump is built with cast iron casing, bronze fitted. It can, however, be made all iron, all bronze, all stainless steel, or of other special metals to suit any industry. Bulletin B-6040 available on request.

New Light-Weight Respirator

The new Willson bantam respirator is described as the lightest weight throw-away filter-type respirator yet to receive the U. S. Bureau of Mines approval. It is the result of constant research and development by Willson engineers who have been working to meet industry's demand for protection without loss of working efficiency.

The bantam is said to be so light in weight and so easy to breathe through that it can be worn for long periods of time without causing any noticeable discomfort or slowing down of the worker. From headband to exhaust valve it is a completely rugged assembly. All rubber facepiece can't be crushed out of shape.

Further information will be furnished upon request to this publication or to Willson Products, Inc., Reading, Pa.

New Split Reverse Hook Sheave

Announcing the new Mascot safety split reverse hook sheave. The new sheave shown here incorporates all of the features of the standard split hook sheave with the added safety feature of a completely closed split hook eye assembled in a reverse direction which prevents it from coming out at the wedgeye.

Made of manganese and available in three designs, the sheaves are equipped with "Oilite" bronze bearings or New Departure greased life ball bearings. For additional information write to Harley A. Coy, care of American Zinc Co. of Tennessee, Mascot, Tenn.

General Electric Announces New Line of D-C Motors

Compactness and improved protection are two outstanding features of a new line of d-c motors recently announced by General Electric. A new design of rolled-steel frame and improvements in end-shield and bearing-bracket construction combine to give the new motors excellent protection from external damage. The use of Formex wire coils and a specially developed Glyptal insulating varnish provide high resistance to impact, abrasion, and the action of foreign materials. The motors can be furnished with sleeve or ball bearings.

Open motors are available in constant-speed ratings from ½-hp. at 850 r.p.m. up to and including 60-hp. at 1,750 r.p.m.; and, in adjustable-speed ratings from ½-hp. at 850/3,400 r.p.m. up to and including 15-hp. at 500/1,800 r.p.m. Motors in the

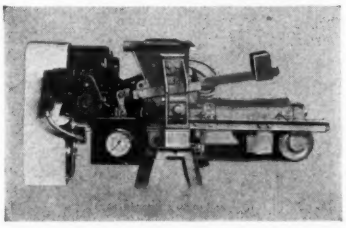
larger ratings (beginning at 50-hp., 850 r.p.m.) embody additional design innovations such as a new system of self-ventilation, extra protection of all current-carrying and rotating parts, and large conduit boxes. New V-type double-brush holders give better commutation and permit rotation in either direction and a new type lifting lug facilitates handling.

Other features common to the entire line include lower WR^2; small diameter, which means low headroom; reversal without changing any parts of the frame, fan, or brush rigging; and Textolite wedges in the armature slots to protect the windings.

Hardinge Weight Recording Feeder

Hardinge Company, Inc., of York, Pa., announces a new weighing feeder, which incorporates a direct recording and totalizing attachment. Like the well known Hardinge contant weight feeder, this new feeder uses the principle of a compensating balanced belt on a pivoted frame, which has proven to be extremely accurate, but very simple.

In the present design a method has been developed whereby the feeder is



calibrated to read direct in tons, pounds or kilograms, as the case may be, which reading is registered by a pointer on a meter. On this same meter are two weight recording registers, one records the total accumulated weight and the other is a reset register which will record batch or time runs. The same system may be employed for use when the feeder is controlled remotely, and the recording instruments may be placed on a panel any distance desired from the location of the feeder. A distinctive feature of the whole arrangement is its simplicity and accuracy which is particularly advantageous in more or less cramped and dusty locations, but where close control and accuracy is required. The feed rates of various sizes of these feeders range from two or three pounds per hour up to 2,000 tons per hour. The size of feed ranges from fine products up to pieces as large as 12-in. diameter.

Condor Whipcord Endless Belts Now Stock in Standardized Sizes

Due to the growing use of short, flat endless belts on short-center and pivoted-motor-base drives, The Manhattan Rubber Mfg. Division, Passaic, N. J., announces that Condor whipcord endless belts are now available from stock for prompt shipment in a number of sizes and in two styles. The two styles which are carried in stock are capable of handling drives from ¼ to 25 hp. and are applicable to more than 1,500 different drives.

R & S Announce Several New Plants

Roberts and Schaefer Company, Chicago, Ill., announce contracts for the following plants:

Lindsey Coal Mining Company Punxsutawney, Pa.—Stump air-flow coal cleaning equipment for cleaning ½-in. x 0 raw coal at a feed rate of 45 tons per hour. Plant to be installed at No. 8 Mine, Punxsutawney, Pa. Plant to be completed December 1, 1940.

Roslyn-Cascade Coal Company, Bellingham, Wash.—Stump air-flow coal cleaning equipment for cleaning ¼-in. x 0 coal at a feed rate of 15 tons per hour. Mine located at Ronald, Wash. Plant to be completed December 1, 1940.

Sycamore Coal Company, Cinderella, W. Va.—Complete hydro-separator coal washing equipment for treating 3-in. x 0 coal at a rate of 125 tons per hour, provision being made to load 3-in. x 1-in., 1-in. x ⅜-in. and ⅜-in. x 0 coals. Plant to be completed December 15, 1940.

Bird Coal Company, Tire Hill, Pa.—Complete crusher and loading boom installation, capacity 250 tons per hour, for reducing lump coal to 1¼-in. slack. Plant to be completed November 15, 1940.

Page Coal and Coke Company, Pageton, W. Va.—Hydro separator coal washing plant and revisions to existing tipple complete with all structures, capacity 700 tons run-of-mine per hour, washing capacity for 6-in. x 1¼-in. raw coal, picking of lump and screening of coal into lump 6-in. x 3-in. egg, 3-in. x 1¼-in. stove, 1¼-in. x ⅝-in. nut, ⅝-in. x ¼-in. pea, and ¼-in. x 0 slack. Plant to be completed January 1, 1940.

"I Am Proud He Is My Uncle"

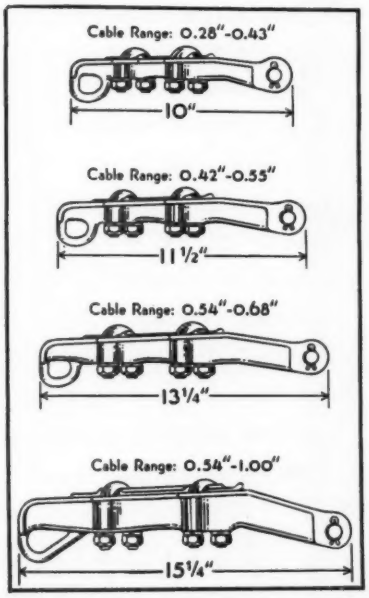
J. O. Lashar, advertising director for American Chain and Cable Company, has responded to the urge for a symbol of American unity by introducing the new coat lapel button shown herewith.

Parisian Novelty Company, Chicago, will manufacture these buttons and all those interested in buying them should correspond direct with this source.

Mr. Lashar has further demonstrated his patriotism by donating all revenue from royalties on this button to the American Red Cross.

Larger Clamp for Straight-Line Dead-Ends

Expanding its line of special clamps for dead-ending bus conductors in stations or line conductors at towers, the Ohio Brass Company, Mansfield, Ohio, has added a fourth and larger size. The three original clamps accommodated 0.28-0.43-in., 0.42-0.55-in. and 0.54-1.68-in. cables, respec-



tively, while the new clamp is for 0.54-1.00-in. cables. Known as Stratelines, these clamps allow a cable to pass through the dead-ending device in a straight line. This design prevents twisting of wire and clamp, and clearances are greater. Intermediate fittings are not necessary with cable buses because the clamp can be connected directly to a clevis-type suspension insulator. Socket and clevis fittings can be furnished, however, to provide adequate clearance when used for dead-ending conductors on transmission structures. A stringing loop at one end of the clamp simplifies installation and makes hot-line changes easier and safer, it is claimed. Clamp surfaces are free from sharp points which might induce flashover or radio interference. The clamp is made of malleable iron, hot-dip galvanized.

Sullivan Announces New Distributor

The Sullivan Machinery Company announces the appointment of the Bergstrom Steel Company, Ltd., of Los Angeles and Oakland, Calif., as distributors for their detachable rock drill bits.

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Satisfactory cores guaranteed

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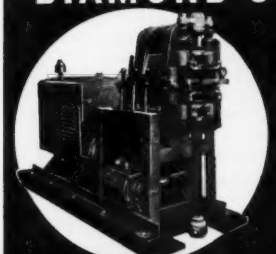
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PRE-PRESSURE GROUTING FOR MINE SHAFTS... GROUND SOLIDIFICATION FOR WET MINE AREAS BY OUR STOP GROUT METHOD. WATER WELLS AND DISCHARGE HOLES DRILLED AND GROUTED... ELECTRIC DRILLS FOR INSIDE MINE DRILLING..
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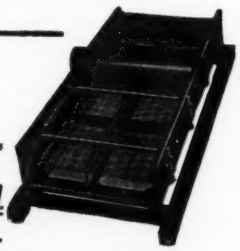
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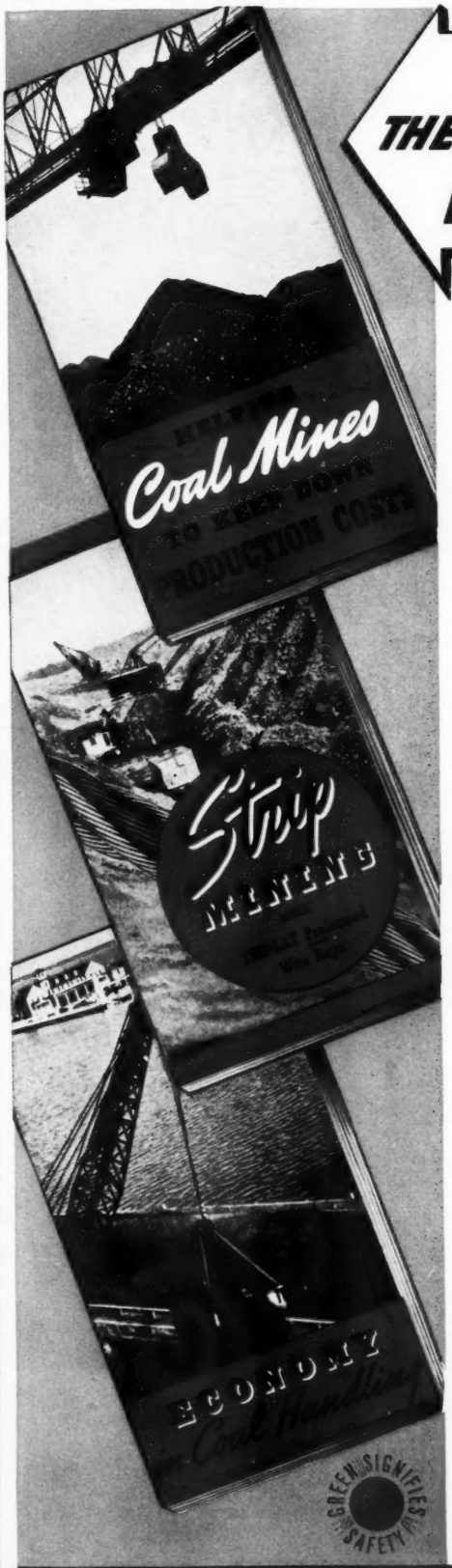

THESE New Booklets WILL REALLY HELP

● Here are three of the most constructive little booklets recently produced in the industry. They are far more of a data or reference book than an advertisement. Most of the pages devote themselves to recommending the particular construction, grade and type of rope best suited to individual applications.

And the booklets are specialized, too. One for the strip mine operator—one for the man who handles coal—one for shaft mining and special mine applications. The latter book not only carefully specifies the exact rope needed for a particular job or application, but carries ready-reference tables of strengths, weights and prices of all wire ropes (sizes and constructions) commonly used in mining. For your **free** copies, sign and return the coupon—today. In the meantime:—

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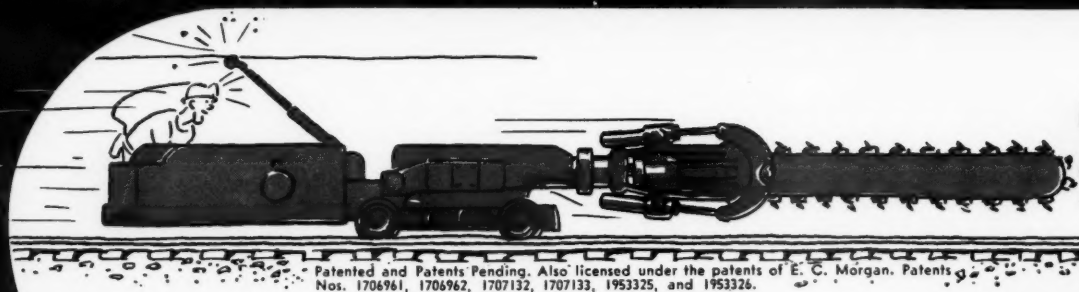

29 U
CUTTER

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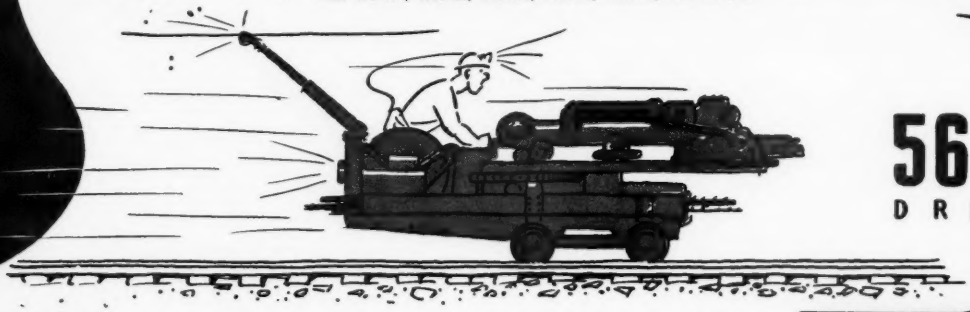

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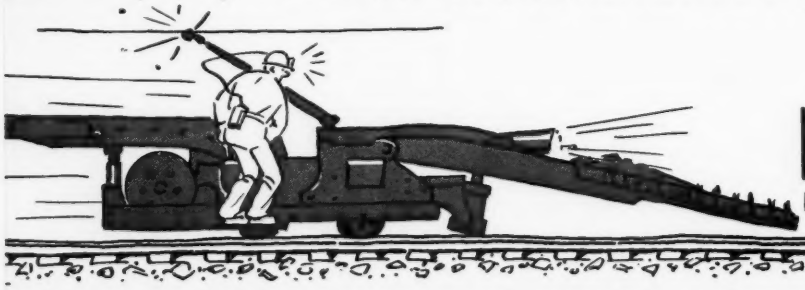

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And safety the watchword for care on the way;
My track is well laid with the wide side kept clear,
We highball our tonnage with nothing to fear.
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Come on down and meet them, we'll show you some speed.

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